

LEVANTINE LATE NEOLITHIC

POTTERY ASSEMBLAGES:

The Reworking of

Old 'Cultural' Typologies

At Wadi ath-Thamad Site 40

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By

Carrie Ellen Dunn

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ABSTRACT

The relationships of the archaeological cultures of the Late Neolithic Period in the southern Levant have been the subject of much debate. As such, the excavation of the Late Neolithic site of WT-40, approximately 20 km southeast of Madaba, Jordan by the Wadi ath-Thamad Archaeological Project Survey team in 2004 will help to clarify and expand the understanding of this time period. The pottery collected from WT-40 has the potential to aid in establishing the chronological and cultural relationship between the Yarmukian and Jericho IX assemblages.

The pottery assemblage from WT-40 is analyzed according to the typology developed by Garfinkel (1993), supplemented by an examination of the method of vessel construction. Statistical analyses are performed to validate the sample of pottery from WT-40 and compare it to other Late Neolithic pottery assemblages from the region.

Analysis and comparison of the WT-40 pottery determined that it demonstrates typological, technological, and stylistic similarities to that of Sha 'ar Hagolan, as well as exhibiting the characteristic decoration of Jericho IX assemblages. The results indicate flaws in the current classificatory system based on "type sites" and *fossiles directeurs*. The overlap between Yarmukian and Jericho IX assemblages indicates that they belong to the same industry, and thus socioeconomic culture group. Pottery assemblages from Sha 'ar Hagolan and Dhra' each identify phases/facies within that industry. The assemblage from WT-40 then constitutes a regional subculture within that cultural group. This interpretation is significant in its attempt to clarify the debate concerning the Yarmukian-Jericho IX relationship, as well as to define the assemblage from WT-40 and orient subsequent research.

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TABLE OF CONTENTS

PERMISSION TO USE.....	i
ABSTRACT.....	ii
ACKNOWLEDGEMENTS.....	iii
LIST OF TABLES.....	viii
LIST OF FIGURES.....	ix
CHAPTER 1 - INTRODUCTION.....	1
1.1 Introduction.....	1
1.2 Terminology and Classification.....	4
1.2.1 Late Neolithic Terminology and Classification.....	4
1.2.2 General Terminology and Classification.....	6
1.3 Research Design/Goals.....	9
CHAPTER 2 - CONTEXT AND SETTING.....	12
2.1 Introduction.....	12
2.2 Settlement and Subsistence Patterns.....	15
2.3 Late Neolithic Material Culture.....	19
2.3.1 Yarmukian Material Culture.....	19
2.3.2 Jericho IX Material Culture.....	22
2.3.3 WT- 40 Material Culture.....	24
2.4 Discussion.....	26
CHAPTER 3 - METHODOLOGY.....	28
3.1 Introduction.....	28

3.2 Analysis of WT-40 Ceramics.....	30
3.2.1 Existing Typology	30
3.2.2 Additional Characteristics	33
3.2.3 Statistical Analysis of WT-40.....	35
3.3 Comparative Analysis	37
CHAPTER 4 - ANALYSIS OF THE WT-40 CERAMICS.....	39
4.1 Context.....	39
4.2 General Description	44
4.3 Typological Description.....	45
4.3.1 Class A Small Open Vessels.....	46
4.3.2 Class B Small Closed Vessels	47
4.3.3 Class C Medium- Sized Open Vessels	49
4.3.4 Class D Medium- Sized Closed Vessels.....	50
4.3.5 Class E Large Open Vessels	52
4.3.6 Class F Large Closed Vessels.....	53
4.3.7 Handles	54
4.3.8 Bases	55
4.4 Decoration	55
4.4.1 Red Slip	56
4.4.2 Cream Slip	56
4.4.3 Burnishing.....	57
4.4.4 Wide Painted Lines.....	58
4.4.5 Thin Painted Lines	58

4.4.6 Herring- Bone Incision	58
4.4.7 Frame Incision	59
4.4.8 Other Incisions.....	59
4.4.9 Other Decoration (Plastic and Impression).....	59
4.5 Construction	60
4.6 Temper and Inclusions	62
4.7 Thickness	62
4.8 Firing.....	63
4.9 Recycled.....	63
4.10 Conclusion	64
CHAPTER 5 - COMPARISON OF WT-40 POTTERY AND OTHER LATE NEOLITHIC SITES	66
5.1 Introduction.....	66
5.2 Validity of the WT- 40 Assemblage	67
5.3 Comparison	70
5.3.1 Contrast of Pottery.....	71
5.3.2 Statistical Comparison of Decoration.....	72
5.3.3 Comparison of Other Material Culture.....	73
5.4 Conclusion	76
CHAPTER 6 - SUMMARY AND CONCLUSIONS	78
6.1 Summary	78
6.2 Reassessing the Pottery Typologies	81
6.3 Implications for the Yarmukian- Jericho IX Relationship.....	84

6.4 Conclusion	89
REFERENCES CITED	91
APPENDIX A - WT-40 POTTERY ASSEMBLAGE.....	97
APPENDIX B - PLATES: DECORATED POTTERY	105
APPENDIX C - ANOVA TEST CALCULATIONS	110
C.1 ANOVA Test Comparing the Pottery collected from Each Unit at WT- 40.....	110
C.2 ANOVA Test Comparing Decorations at WT- 40 with Sha' ar Hagolan.....	111

LIST OF TABLES

Table 3.1. Format of an ANOVA table.....	37
Table 5.1. ANOVA table for comparing the excavated units at WT- 40.....	68
Table 5.2. Percentages of the pottery from WT- 40, Sha 'ar Hagolan, and Munhata.....	69
Table 5.3. ANOVA table comparing decorations at Sha 'ar Hagolan and WT- 40.....	73
Table 6.1. Firing percentages in relation to maximum thickness categories.....	80
Table A-1. The number of items per type at WT- 40.....	97
Table A-2. Summary of the total sherds from WT- 40.....	97
Table A-3. Summary of sherds below the colluvium from WT- 40.....	97

LIST OF FIGURES

Figure 1.1. Map of location of the Wadi ath-Thamad LN sites.....	2
Figure 1.2. Henry's classificatory hierarchy.....	7
Figure 2.1. Topographic map with WT-40.....	15
Figure 2.2. Map of LN sites and geographic distributions.....	17
Figure 3.1. Yarmukian Typological chart.....	32
Figure 4.1. Contour Map of WT sites and excavation units.....	40
Figure 4.2. Top plan of Unit A47.....	41
Figure 4.3. Top plan of Unit A53.....	42
Figure 4.4. Top plan of Unit A54.....	43
Figure 4.5. Drawings of sherds with cordon appliqué.....	60
Figure 6.1. Type D1 jar from Sha 'ar Hagolan.....	82
Figure 6.2. Type D2 jar from Jericho Stratum IX.....	82
Figure A-1. Drawings of Type A1 vessels from WT- 40.....	98
Figure A-2. Drawings of Class B vessels from WT- 40.....	99
Figure A-3. Drawings of Class C vessels from WT- 40.....	100
Figure A-4. Drawings of Class D vessels from WT- 40.....	101
Figure A-5. Drawings of Class E vessels from WT- 40.....	102
Figure A-6. Drawings of loop handles from WT- 40.....	103
Figure A-7. Drawings of bases from WT- 40.....	104
Figure B-1. Burnished wide paint decoration.....	105
Figure B-2. Thin painted decoration.....	106
Figure B-3. Framed herring-bone incision with paint.....	107
Figure B-4. Framed herring-bone incision.....	107
Figure B-5. Painted framed herring-bone incision.....	108
Figure B-6. Painted and framed herring-bone incision.....	108
Figure B-7. Mendable sherds with painted herring-bone incision.....	109
Figure B-8. Cordon appliqué on mendable sherds.....	109

CHAPTER 1

INTRODUCTION

1.1 Introduction

During the summer of 2001, the Wadi ath-Thamad Regional Survey identified two neighbouring Late Neolithic (henceforth LN) sites about 20 km southeast of Madaba, Jordan (Figure 1.1). The surface of Umm Meshrat I (WT-40) yielded numerous lithics, the remains of stone structures, and a small number of potsherds. Upslope from WT-40, Umm Meshrat II's (WT-96) initial surface study revealed a large quantity of lithics (primarily burins), multiple circular limestone structures, and possible rectilinear structures. Test excavations were initiated opening five test probes at WT-40 and two probes at WT-96. Both sites show affinities with LN assemblages and are roughly contemporaneous (Cropper, Foley and Linnamae 2003:15). The results of this preliminary study have been documented in Dawn Cropper's M.A. thesis (Cropper 2002).

In 2004, the Wadi ath-Thamad Project survey team returned to discover a Bedouin camp located directly on top of WT-96, and an attempt at cultivation cutting through WT-40. In response, a salvage excavation was initiated at WT-104, a LN site located on the slope north of WT-40, and at WT-40. The preliminary results of the ceramic inventory from these three sites demonstrate affinity with both the Yarmukian and Jericho IX typologies. This material provides the impetus underlying this study.

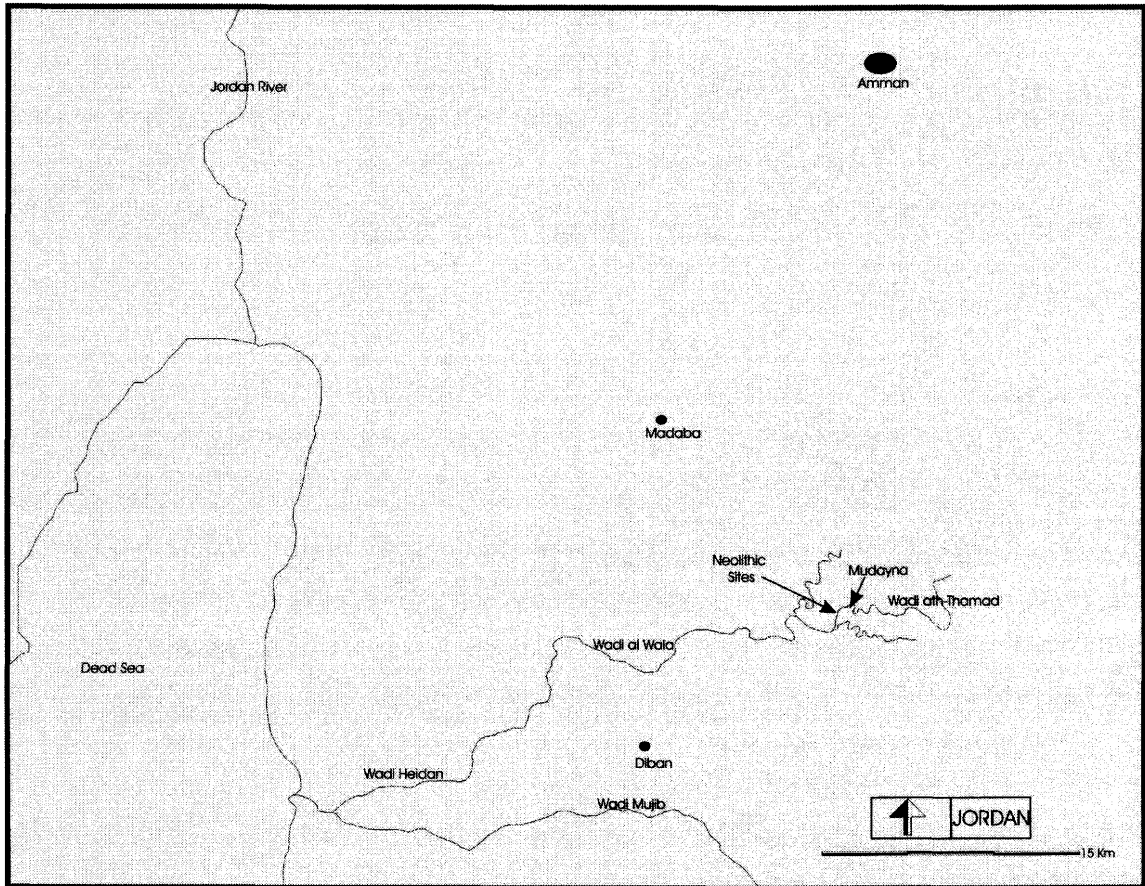


Figure 1.1. Map of location of the LN sites discovered by Wadi ath-Thamad Project Survey (Foley 2006).

The Wadi ath-Thamad survey is one component of a broader research project directed by Dr. P.M.M. Daviau of Wilfrid Laurier University, the Wadi ath-Thamad Archaeological Project, which began in 1995. Its primary focus is the excavation of Khirbat al-Mudayna, an Iron Age fortified town (Daviau 2000:1). The second component of the Project is the Wadi ath-Thamad Regional Survey which began in 1996 under the direction of Andrew Dearman. Dr. Chris Foley of the University of Saskatchewan became the director in 1998 and amended the intentions of the survey from detecting major Roman and Iron Age sites to include the identification of prehistoric sites. The aim of the Wadi ath-Thamad Regional Survey is to determine a chronology of the occupations within the region, supplemented by analysis of settlement pattern and spatial distribution.

The sites located in the Wadi ath-Thamad survey area span from the Lower Paleolithic to the present with an apparent void in the occupational history occurring during the Bronze Age. This study will focus on the early LN occupations discovered and excavated from 2001 to 2004, WT-40, WT-96, and WT-104. The 2001 excavation of two 1x1 m test units on either side of a wall at WT-96 produced only a small amount of pottery, whereas the test probes of WT-40 revealed an earthen floor containing a pottery sherd and the base of a Haparsa point (Cropper 2002:49). Unfortunately, a Bedouin camp situated on WT-96 prevented any further excavation in 2004. The excavation of two 6x6 m units at WT-104 resulted in the exposure of architectural remains, but most of the artifacts appear to have eroded down slope. Furthermore, the 2004 excavation of three 6x6 m units at WT-40 yielded a variety of lithics, potsherds, features, occupation surfaces, and architecture. Due to the limited data available from

WT-96 and WT-104, the primary focus of this study is orientated toward the assemblage, particularly the ceramic assemblage, recovered from WT-40.

1.2 Terminology and Classification

1.2.1 Late Neolithic Terminology and Classification

All theoretical approaches in archaeology rely on some form of classificatory system to organize the data based on material culture, time and space, or economy and society (Henry 1989:79). Research conducted on the LN in the Levant does not deviate from this general structure. In 1951, Moshe Stekelis identified the Yarmukian culture based on the excavation of Sha 'ar Hagolan, a site located near the Yarmuk River. The culture was defined based on the types, forms, and techniques of its flint industry, pottery, and art objects (Stekelis 1951:19). However, Stekelis' initial intention in establishing the characteristics of the "Yarmukian culture" was to argue for the overall existence of a Neolithic culture in Palestine (Stekelis 1951:18), supported also by Garstang's excavations at Jericho (Stratums XII and IX) (Garstang et al. 1935, 1936). Kathleen Kenyon then proposed the existence of Pre-Pottery Neolithic A (PPNA), Pre-Pottery Neolithic B (PPNB), Pottery Neolithic A (PNA) (Jericho IX), and Pottery Neolithic B (PNB) (Jericho VIII) from her excavations at Jericho (Kenyon 1957, 1960). Kenyon argued that the Yarmukian culture fit into the PNB based on the similarity of herring-bone patterns on some of the pottery. However, Stekelis' comparison of the lithic assemblages indicated a greater similarity between PNA (Jericho IX) and Yarmukian (Stekelis 1972:43).

Further research, excavation, and survey of the Levant have subsequently identified more sites relatable to the original Yarmukian or Jericho IX assemblages. The growing dataset accommodated Garfinkel's analysis of the PN ceramic assemblages. Based on form and decoration, Garfinkel established a ceramic typology for Yarmukian sites and suggested a typology for Jericho IX sites (Garfinkel and Miller 2002:4). Nevertheless, these ceramic typologies were defined on the basis of small assemblages from a restricted number of sites. With the gradual discovery of a few more LN sites, these typologies have mutated into being considered representative of specific cultures. However, a culture cannot be defined by ceramics alone. Moreover, continuing research in this area has blurred the distinctive characteristics used to separate the ceramic typologies. Such issues have increasingly contributed to the problematic nature of formulating an accurate understanding of the LN.

As a result, the ceramic assemblages from the LN in the Levant are the subject of a complex debate (Lovell 2001:6). The division of Yarmukian and Jericho IX pottery is based, primarily, on differences in decoration, with Yarmukian assemblages characterized by framed herring- bone incision and Jericho IX assemblages by burnished red painted patterns (Garfinkel 1999a:96). Yet, a number of site assemblages discovered demonstrate an overlap of these characteristic decorative styles, for instance those from Jericho and Wadi Shu'eib (Obeidat 1995:106). According to Lovell, misinterpreting evidence to support the separation of the two assemblages has turned Jericho IX into a "floating typology", suggesting that the distinction may be artificial (Lovell 2001:6). Some archaeologists attempt to avoid the issue altogether by combining all of the assemblages together under the term of Late Neolithic or Pottery Neolithic (Banning

1998). Others, such as Garfinkel and Miller, explicitly state that the typologies each represent distinct cultural identities which existed simultaneously in relative isolation (Garfinkel and Miller 2002:4). However, the overlap in the stylistic features of the decoration of Yarmukian and Jericho IX ceramics cannot be overlooked and requires further investigation.

1.2.2 General Terminology and Classification

One of the immediate problems facing analysis of the LN in the Levant is in regards to terminology and classification (Henry 1989:79). Early literature uses the term Yarmukian to refer to a variety of classificatory scales from industry (Stekelis 1951) to culture (Stekelis 1972). Similarly, Jericho IX has become a term applied to an assemblage, a group (Lovell 2001:6) and even a cultural tradition (Garfinkel 1999a:68). The ever increasing and unwarranted use of such terms have begun to obscure the evidence and its interpretation (Lovell 2001:6). Placing new assemblages under taxonomic labels into which they “best fit” reduces the reliability of the typologies (Henry 1989:84). It is therefore essential to employ a classificatory system with a clearly defined terminology.

The classificatory hierarchy adopted here was developed by Clarke (1968) and modified by Henry (1989). Clarke argues that archaeological cultural assemblages are representative of polythetic groups, the precise nature of which demands definition (Clarke 1968:37). He attempts to define the groups through a hierarchy of material culture systems from artifact types to assemblage, to culture, to culture group, and, finally, to technocomplex. Henry combines the socioeconomic terms employed by Clarke with an archaeological hierarchy of material cultural (Figure 1.2). Although

Henry produced the classification for lithic analysis, ceramics also satisfy the two conditions required for material culture classification. First, pottery is a common attribute within early LN sites, and second it supplies large datasets for quantification and detailed attribute analysis (Henry 1989:81).

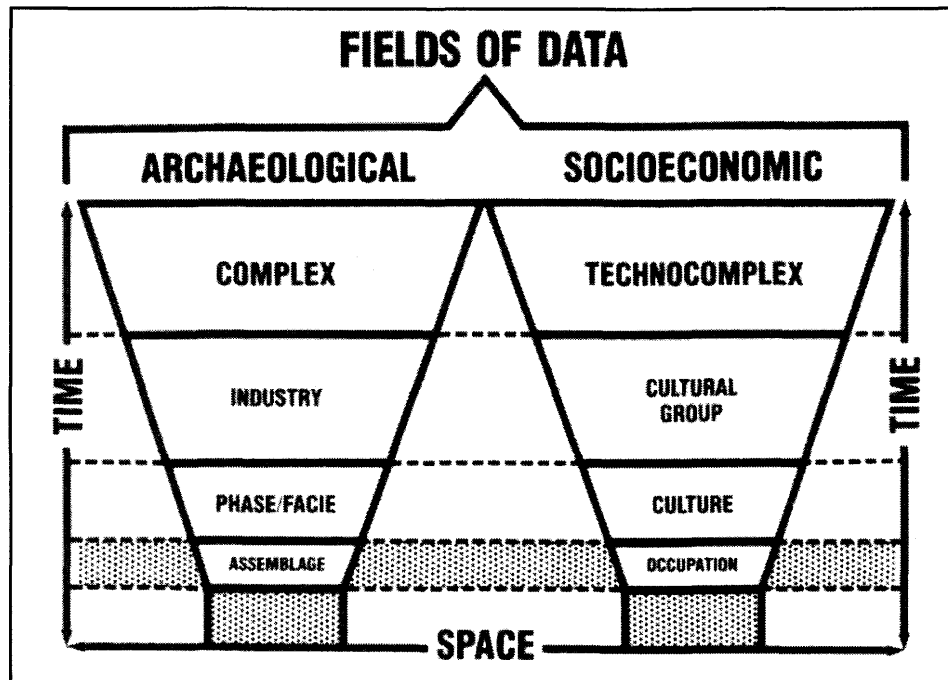


Figure 1.2. Henry's classificatory hierarchy as combined with Clarke's socioeconomic framework (Henry 1989:83).

The lowest level of classification is an artifact *assemblage*. Its importance lies in the fact that it is the only unit that is common to all three aspects of classification, material culture, temporal-spatial, and social (Henry 1989:82). The term assemblage should be applied to the material remains resulting from a brief temporal occupation of a distinct culture from a limited spatial boundary (Henry 1989:82). An archaeological assemblage is relatable to a socioeconomic occupation (Henry 1989:83).

The next scale in the hierarchy is that of *phase/facies*. This classificatory unit is inwardly homogeneous, comprised of assemblages with a very high level of similarity (Henry 1989:83). A *phase/facies* should involve specific technological and typological attributes, as well as distinct stylistic ones which are not related to function (Henry 1989:83). Types of decoration may serve as such a stylistic attribute for ceramics. A socioeconomic culture can be represented by an archaeological phase/facies (Henry 1989:83).

Industry is the intermediate scale in the classification. An industry should have a great affinity in sharing specific technological traits involving method and technique, and typological attributes at both the class and type level (Henry 1989:83). These characteristics should also include quantitative boundaries, such as widths, and frequency ranges (Henry 1989:83). An industry in archaeology is relatable to a socioeconomic cultural group, comprised of collateral cultures (Clarke 1968:320; Henry 1989:83).

The largest scale in the classification system is a *complex*. A complex should consist of an assemblage which shares many sets of characteristics related to the technology but has a low typological affinity (Henry 1989:82). Membership in a complex should identify a range in the frequency of specific technological traits, such as methods of construction, and classes like vessel forms (Henry 1989:83). A technocomplex, or large group of cultures which share common type families due to similar environments, economies, and technologies (Clarke 1968:321), is the socioeconomic representation of an archaeological complex (Henry 1989:83).

Archaeologists are confronted with the task of imposing an order onto a large number of assemblages, all with varying degrees of similarity. Employing a clearly

explicit means of classification is therefore essential. Past attempts at the “presence-absence” or guide fossil approach are futile because they lack the necessary frequencies of specific attributes (Henry 1989:85). A properly executed comparison should aim towards quantifying specific assemblage characteristics, as opposed to identifying *fossiles directeurs* (Henry 1989:85).

1.3 Research Design/Goals

Beginning at approximately 7,600 B.P. and ending around 7,000 B.P., the LN Period in the southern Levant has been neglected until the last several decades of archaeological studies. As a result, it is yet to be fully understood. During the Pottery Neolithic, the southern Levant experienced a significant decline in the number of sites and a shift in their distribution (Garfinkel and Miller 2002:1). The possibility of culture change in the LN is illustrated by the advent of ceramics and the settlement shift at the end of the Pre-Pottery Neolithic. It is within this context of cultural transformation that the debate surrounding the ceramic typologies arises.

The typologies created for the Yarmukian and Jericho IX assemblages are not strong enough to claim that they represent two distinct cultural assemblages. Chapter 2 will provide a brief account of the LN in the Levant focusing on the issue of the relationship between Yarmukian and Jericho IX, as well as WT-40's position within the typologies. This study will attempt to clarify the relationship between Yarmukian and Jericho IX pottery by comparing the material from WT-40 to other assemblages. The tentative position adopted here is that the two assemblages correspond to phases within one industry, which therefore represent two different subcultures within one socioeconomic cultural group. Along with clarifying the Yarmukian – Jericho IX debate,

this investigation will also assist in defining the Neolithic Wadi ath-Thamad material and help orient subsequent research.

The proposed research will begin by basing the ceramic analysis on the typological framework established by Garfinkel for Sha 'ar Hagolan, as adapted from the Munhata typology (Garfinkel 1992; 1999a; Garfinkel and Miller 2002). However, it intends to further supplement Garfinkel's stylistic study by incorporating additional qualities that have not been considered adequately in past research, for instance thickness, temper and inclusions, degree of firing, and finishing procedures. By incorporating analysis of the surface decoration with examination of the method of vessel construction the hope is to achieve more complete descriptions of the ceramic assemblages and thereby provide more extensive criteria for determining the relationship between the two industries, both chronologically and culturally. An introduction to the excavation of WT-40 and the methodological approach to its interpretation will be provided in Chapter 3. A detailed account of the dataset and the results of the analysis performed on the WT-40 ceramic assemblage will be summarized in Chapter 4.

The Late Neolithic sites discovered along the Wadi ath- Thamad appear to be unique, and possess the potential to clarify our understanding of the LN in the southern Levant. The findings from the pottery analysis of WT-40 could aid in establishing the chronological and cultural relationship between Yarmukian and Jericho IX assemblages. Chapter 5, including a qualitative and quantitative comparison of the pottery assemblages from WT-40 and those of other LN sites in the Levant, will establish the validity of classifying the pottery from the three excavated units at WT-40 as constituting an assemblage, determine that this initial assemblage is a representative

sample, and compare the decorative techniques it demonstrates with those of the Sha 'ar Hagolan assemblage.

The previously mentioned chapters intend to provide the foundation for fitting WT-40 into the broader context of the LN and re-evaluating the validity of the established typologies, ultimately facilitating an enhanced comprehension of the Yarmukian- Jericho IX relationship and furthering the understanding of WT-40, which will be summarized and concluded in Chapter 6.

CHAPTER 2

CONTEXT AND SETTING

2.1 Introduction

The Late Neolithic (LN) Period in the southern Levant extends from approximately 7,600 BP to 7,000 BP. It is preceded by the Pre-Pottery Neolithic (PPN) which has been sequenced by Kenyon in the 1950s to include the Pre-Pottery Neolithic A (PPNA) and Pre-Pottery Neolithic B (PPNB) (Kenyon 1960). Since her extensive excavations at Jericho, Pre-Pottery Neolithic C (PPNC) has also been recognized at sites such as 'Ain Ghazal, representing a transitional period immediately prior to the LN (Rollefson, et al. 1992). The PPNA and PPNB are relatively well defined in comparison to the LN.

Settlements in the PPNA range from stratified occupations with an agglomeration of hut-like structures as at Jericho, Aswad, Netiv Hagdud, Dhra' and Gilgal I, to small, short term occupational sites that lack permanent architecture or are located within a cave, such as Araq adh-Dhûb and Nachcharini (Banning 1998:216). The material culture in the PPNA is derived from the preceding Natufian complex, including a prominently microlithic technology (Banning 1998:201). Distinct lithic types for this period include Hagdud truncations, or bases of compound projectiles, and al-Khiam points, or side-notched projectiles (Banning 1998:201). Two main chipped stone industries have been identified during the PPNA, namely the Sultanian and the

Khiamian (Henry 1989:224-225). Sultanian assemblages, such as those of Jericho and Netiv Hagdud, consist of a larger number of picks, axes, and adzes, as well as sickle blades, burins and perforators (Henry 1989:225; Bar-Yosef, et al. 1991:412-415; Banning 1998:201). On the other hand, Khiamian microlith assemblages are dominated by lunates (Banning 1998:201; Henry 1989:224).

The PPNB is characterized by several very large (over 8 hectares) occupation sites like 'Ain Ghazal, 'Ain Jammam, Basta, and Wadi Shu 'eib (Banning 1998:217). Permanent architecture becomes common at these sites, consisting of clusters of rectangular structures with internal sub-divisions (Banning 1998:219). Lime plaster during this period appears frequently on floors, walls, skulls, statuary, and occasionally figurines, as evidenced at 'Ain Ghazal (Rollefson, et al. 1992; Banning 1998:204-205). The production of White Ware, vessels made of plaster or sometimes carved limestone, or *vaisselles blanches*, also occurs during the PPNB (Kingery, et al. 1988; Rollefson, et al. 1992:459; Banning 1998:205). The chipped stone industry is blade-dominated and includes sickles, burins, end-scrapers, borers, drills, knives, and projectile points (Banning 1998:201). Byblos points, long with rounded shoulders tapering to a broad tang, and Jericho points, with pointed downturned barbed shoulders, predominate with a gradual increase in Amuq points, which are narrow, tapered and leaf-shaped (Banning 1998:202).

The PPNB ends with the abandonment of many sites and a significant decrease in the size of those that were not abandoned, excluding 'Ain Ghazal. The exact causes of the decline of the PPNB are the subject of much debate. Theories concerning climatic change, shifts in settlement pattern, human impact on local environmental conditions through exhaustion of resources, and even biases in the archaeological database have

been proposed to explain the disappearance of the PPNB industry (Banning 1998:229-230). Nevertheless, sites such as 'Ain Ghazal, Wadi Shu' eib, and Basta provide evidence for the existence of an aceramic Neolithic occupation, the PPNC, following the PPNB and preceding the use of pottery in the LN (Rollefson 1993:91). The architecture from the few PPNC sites discovered is semi-subterranean and exhibits further subdivision of internal space into small rectangular chambers (Rollefson et al. 1992:449). The floors continued to be plastered at 'Ain Ghazal, and multiple intact primary burials have been discovered beneath the floors of the structures (Banning 1998:221). The chipped stone assemblages of the PPNC changed dramatically from being blade-dominated in the PPNB to primarily flake-dominated (Banning 1998:203). Unfortunately, the minimal dataset from this period has kept it from being fully understood, though Rollefson (1993) argues for the direct development of the "Yarmukian" phase from the PPNC at 'Ain Ghazal.

It is only within the last few decades that research has begun to focus on the LN period in the southern Levant. The archaeological record attests to significant changes in settlement and subsistence patterns at the onset of the LN. These changes then become amplified through the identification of two ceramic typologies in the southern Levant during the earlier part of this period, namely Yarmukian and Jericho IX. The exact relationship between the two remains unclear; moreover, continuing research has blurred the distinctive characteristics used to separate the ceramic typologies. The recent discovery of WT-40 within the Wadi ath-Thamad region of Jordan (Figure 2.1) necessitates a re-evaluation and of these typologies.

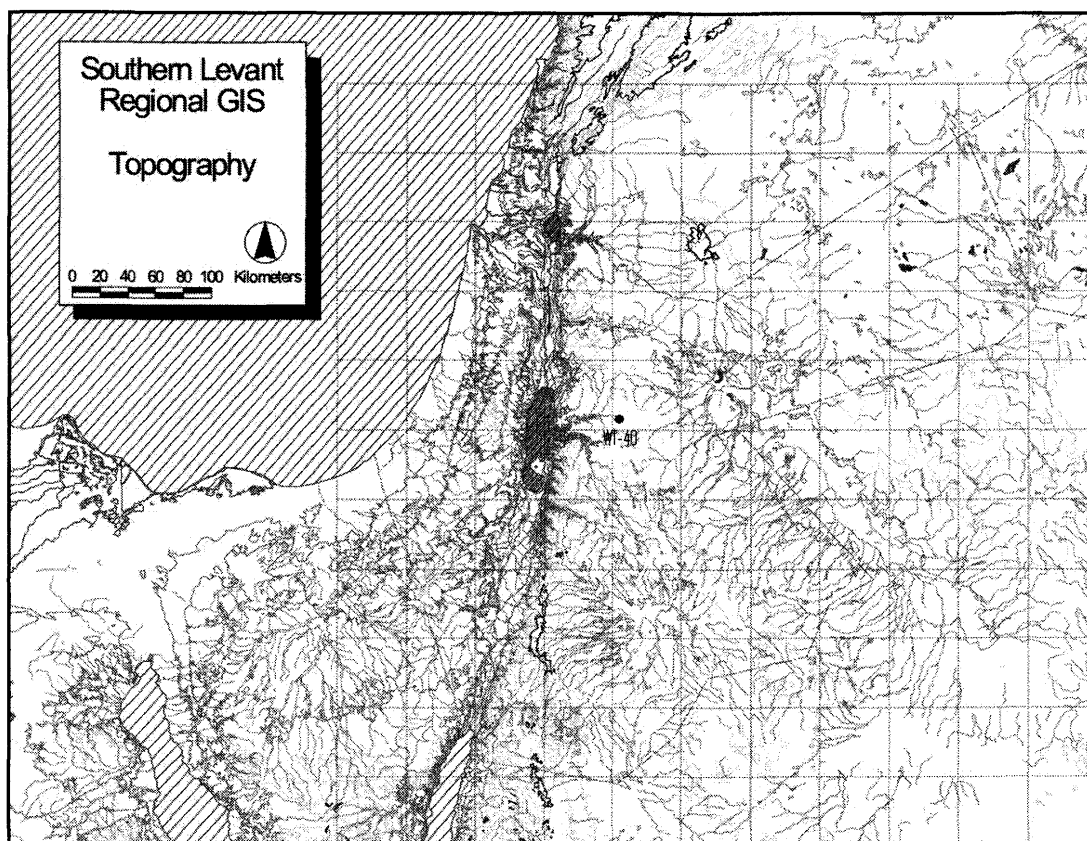


Figure 2.1. Topographic map of the Southern Levant with the location of WT-40 (after www.utoronto.ca/tmap/Levant_org.gif).

2.2 Settlement and Subsistence Patterns

A dramatic shift in settlement pattern occurred during the LN. Initially, PPNB sites were located near springs on low slopes and were of a substantial size (Banning 1998:216). However, near the end of this period many of these sites were abandoned, though exceptions such as 'Ain Ghazal grew up to 14 hectares (Rollefson 1992: 124). Theories pertaining to the pattern of abandonment range from climate change to environmental degradation as a result of cultural and/or economic stresses (Rollefson and Simmons 1987:44; Rollefson and Köhler- Rollefson 1989; Banning

1995:4-5; Gopher 1995:207). Following the initial phase of abandonment, site size and frequency decrease further in the PPNC leaving no definite discernable settlement pattern (Banning 1998:218).

Currently, the early LN settlement patterns are established by means of the Yarmukian and Jericho IX ceramic typologies (Figure 2.2) (Kafafi 1993; Gopher 1995; Garfinkel 1999a). Approximately 20 Yarmukian sites have been identified over an area of 10,000 km² within the Mediterranean climate and vegetation zone (Garfinkel and Miller 2002:4) which stretches to northern Israel, the northern Jordan Valley, and the north and central highlands of Jordan (Banning 1998:218). The major sites are Sha 'ar Hagolan, Munhata, Megiddo, Abu Thawwab, Hamadiya, Habashan Street (Tel Aviv), 'Ain Ghazal, and if the regional margin is expanded further north, Byblos (néolithique ancien) (Garfinkel and Miller 2002:4). While some of these sites are found at the same location as PPNB sites, like 'Ain Ghazal, others are on the upper slopes of mountains, as at Abu Thawwab, or on river terraces, as at Sha 'ar Hagolan (Banning 1998:218). In contrast, Jericho IX sites are primarily located further south, along the edge of the Mediterranean zone, within the Judean Lowlands, south of the Dead Sea and in the desert regions around it (Garfinkel and Miller 2002:4). Fewer than 10 Jericho IX sites have been identified, including Jericho (Stratum IX), Teluliyot Batash (Stratum IV), Lod, Ghrubba, Dhra', and Khirbet ed- Dharih (Garfinkel and Miller 2002:4).

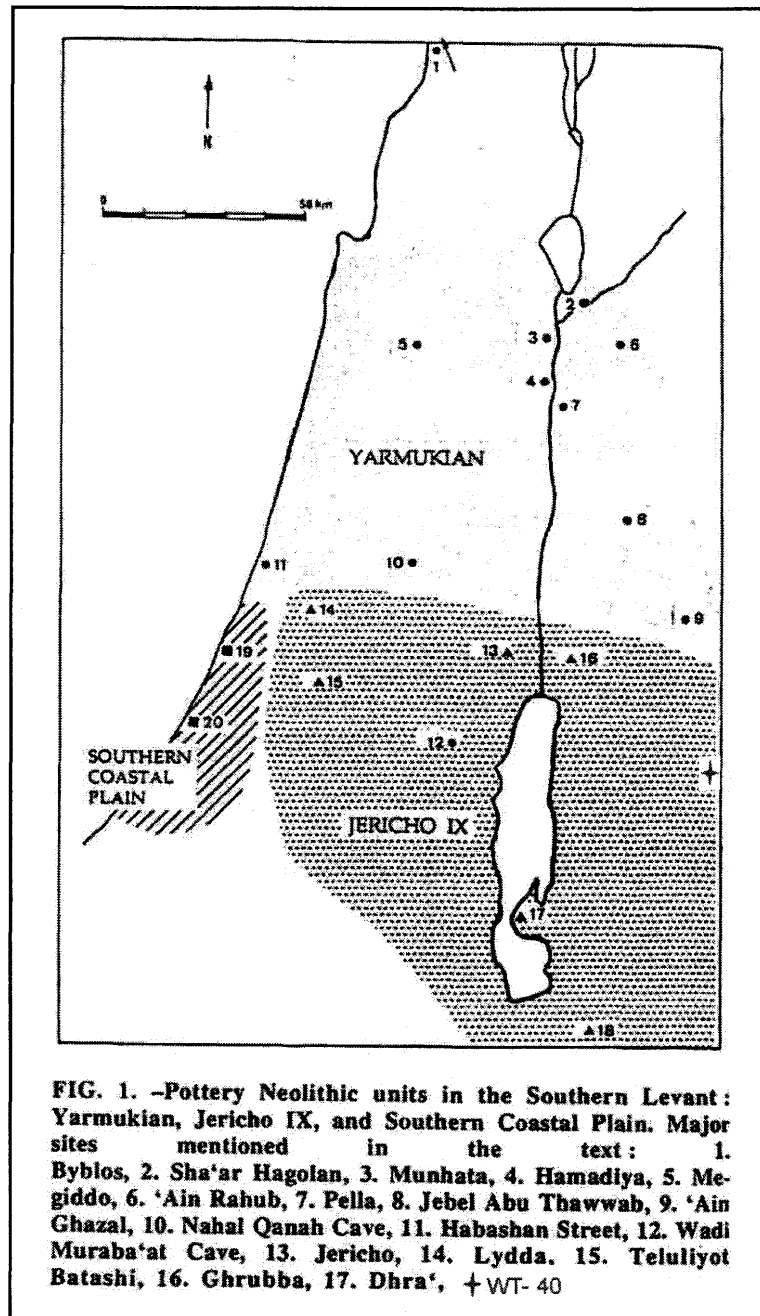


Figure 2.2. Map of LN sites, including WT-40, and Yarmukian and Jericho IX geographic distributions (after Garfinkel 1993:116).

These currently recognized settlement patterns may be the result of the limited number of sites discovered, the areas investigated, and the small assemblages available for study. Many of the LN sites found are located in environments which accumulate large amounts of colluvial and alluvial debris, such as valley bottoms and terraces, which leave the sites unrecognizable without sub-surface testing. Therefore, standard surface surveys can only identify sites which have been exposed through erosion or construction cuts. The sub-surface survey conducted by the Wadi Ziqlab Project, directed by E.B. Banning, is attempting to rectify this observer bias (Banning, et al. 1994:152), but the small assemblages produced by this method are not large enough for accurate analysis and comparison. Many of the LN sites currently identified, other than Sha 'ar Hagolan, have been tested through small scale excavation, producing small and possibly incomplete assemblages which are difficult to study and compare.

A significant shift occurred in subsistence strategies throughout the Neolithic as well. Although the exact date for the domestication of cereals and legumes is a matter of continuing debate and investigation, it is clear that the frequency of domesticate indicators increases throughout the PPN (Banning 1998:214). The founder crops consisted of two-row barley, emmer wheat, einkorn wheat, lentils, peas, chickpeas, bitter vetch, and flax (Grigson 1995:248). During the PPNA and PPNB, hunting continued to be a vital economic activity. Faunal remains from PPNA sites include a variety of small animals as well as gazelle, boar, wild sheep and goat, deer, auroch, ducks, partridge, pheasants, quail, and doves (Banning 1998:212). By the PPNB gazelle have become the main source of protein, supplemented by domesticated goats (Banning 1998:214). The LN continued the trend with increased agriculture and reliance on domesticated sheep and goats (Kafafi 1993:112; Banning 1998:215; Garfinkel and Miller 2002:255).

The LN experienced dramatic shifts in settlement patterns and subsistence strategies in comparison to the PPN. The size and number of sites decreased significantly, and a greater trend toward cereal and legume cultivation and pastoralism illustrate these changes. Another difference between the LN and the PPN currently recognized is the lack of overall homogeneity, as is evidenced in the variation between Yarmukian and Jericho IX assemblages.

2.3 Late Neolithic Material Culture

The relative standardization of architecture and material culture that occurs during the PPNA and PPNB is not a characteristic of the early LN of the southern Levant. Garstang's excavation of Jericho in 1934 began the revelation of Neolithic layers at the site (Garstang, et al. 1953:143-144). Kenyon's research in the 1950s identified two phases within the Neolithic levels at Jericho, the Pottery Neolithic A (Stratum IX) and the Pottery Neolithic B (Stratum VIII) (Kenyon 1960). In 1951 Stekelis' discovery of Sha 'ar Hagolan near the Yarmuk River initiated the definition of two main pottery typologies with associated material culture within the early LN. These typologies include Yarmukian, with Sha 'ar Hagolan as the "type site", and Jericho IX, with Stratum IX from Jericho as the "type site". Currently, many scholars accept this division of early LN material culture, though much debate surrounds the chronological order and possible relationship of these two types of assemblages.

2.3.1 Yarmukian Material Culture

The Yarmukian typology, based on the assemblage from Sha 'ar Hagolan, is differentiated from the PPNB and PPNC by the fact that it has pottery. In general, a

Yarmukian archaeological assemblage is characterized by varying architecture, as well as art objects including figurines, intact primary burials, a flake-dominated chipped stone assemblage with coarsely denticulated sickle-blades, and herring-bone incised pottery (Garfinkel 1993:115).

The style of architecture at Yarmukian sites varies quite substantially from site to site. Initially, the excavation of Sha 'ar Hagolan and Munhata suggested that Yarmukian sites are often associated with pit dwellings (Kafafi 1993:108). However, continued research has discovered rectangular structures at Abu Thawwab, Wadi Shu'eib, 'Ain Ghazal and Megiddo, apsidal structures at 'Ain Ghazal, Abu Thawwab and Megiddo, and round structures at Munhata (Garfinkel 1993:128; Kafafi 1993:108). Kafafi (1993) suggests that these differences are related to site location with pits occurring in the Jordan Valley and stone built architecture utilized in the mountainous regions. Identification of Yarmukian sites is made even more difficult by the fact that they reused walls of older buildings, an example of which can be found at 'Ain Ghazal (Kafafi 1993:108).

One of the defining characteristics of Yarmukian sites is a plethora of art objects, including figurines and carved pebbles. Sha 'ar Hagolan has thus far produced over 200 artistic objects including primarily anthropomorphic figurines of clay or pebbles (Garfinkel and Miller 2002:206). The baked clay figurines frequently are female with "coffee-bean" eyes and exaggerated bodies. The river pebbles are incised with geometric designs and notably resemble stamp seals from contemporary sites in the northern Levant, Mesopotamia, and Byblos (Garfinkel 1993:125).

Currently, burial customs can only tentatively be suggested, as only 5 Yarmukian burials have been described through publication. Two burials were discovered at Wadi

Shu'eib, a child in flexed position below a packed mud floor enclosed by a circle of stones, and an adult orientated north to south with parallel long bones and no cranial remains (Kafafi 1993:112). Sha 'ar Hagolan, Habashan Street and Munhata also each contained within the settlement a single primary burial of an individual in flexed position, with the skull intact and no associated grave goods (Garfinkel 1993:127). Unfortunately, the limited data available presently prevents definite conclusions.

The chipped stone industry found at Yarmukian sites is well defined in the detailed publications of the Sha 'ar Hagolan (Stekelis 1972, Garfinkel and Miller 2002) and Munhata collections (Gopher 1989). Typically, it consists of arrowheads such as Haparsa, Nizzanim and Herzliya points, and sickle-blades with coarse denticulation (Garfinkel 1993:121-122). Dominated by flakes, bipolar cores begin to decrease in frequency and bifacial knives and tabular scrapers appear in the assemblage (Gopher 1995:220). The chipped stone assemblage associated with Yarmukian sites can also include side-scrapers, pointed tools, burins, blades, knives, and other retouched items (Kafafi 1993:110). This range of lithics has the potential to cause some confusion because most of these flint tools can also be found at other LN sites which are not considered identifiably Yarmukian sites (Garfinkel 1993:123).

The pottery of Yarmukian sites is considered to be one of the defining characteristics of the assemblage. It is hand-made from straw (chaff)-tempered local clays with high carbonate content and is represented by a variety of shapes and sizes not uncommon in the LN (Garfinkel and Miller 2002:87). The firing technique is not perfected and many vessels are poorly fired. The assemblage can be divided into fine ware and coarse ware and exhibits surface treatments of grass and water-smoothing (Garfinkel and Miller 2002:88). Most of these characteristics are common during the

LN. The currently recognized *fossile directeur* for Yarmukian pottery assemblages is framed herring-bone incised decoration encircling a vessel, but other decorative techniques include red slip, red paint, and burnishing (Garfinkel and Miller 2002:104).

2.3.2 Jericho IX Material Culture

Garstang's Stratum IX at Jericho is considered to be the "type site" for identifying Jericho IX assemblages. Initially identified by the presence of pottery and a microlithic assemblage, its early LN character was obvious (Garstang 1935:168). Generally, Jericho IX assemblages are characterized by scanty architectural remains, a lack of art objects and burials, a flake-dominated chipped stone assemblage with trapezoidal curved sickle-blades, and cream slipped pottery with burnished red paint decoration.

The architecture at Jericho IX sites is rather scarce other than a few pits which may be dwellings or possibly quarries for mud-brick (Gopher 1995:210). The site of Jericho has yielded pit-dwellings made of circular mud-bricks on stone foundations (Kafafi 1992:120). Lod produced a similar find of circular mud-brick and a sunken mud structure (Gopher 1995:210). Recent excavation of Dhra' identified 3 fragmentary stone wall segments as well as pits, indicating that stone construction can also be associated with Jericho IX assemblages (MacKay 2006: personal communication). The general lack of clearly defined architecture at Jericho IX sites may explain the limited number of sites identified.

One of the features that distinguishes Yarmukian sites from Jericho IX sites is the obvious symbolic representations of ideology. Jericho IX sites do not seem to have any art objects in comparison to the plethora found with Yarmukian assemblages. The

only potential exceptions are a single figurine found at Givat Haparsa and a possible fragment of a figurine from Teluliot Batashi (Gopher 1995:218). Similarly, Jericho IX sites have even less information to offer than Yarmukian sites in the case of burial practices. Only 2 clear burials have been discovered in association with Jericho IX assemblages, both primary, flexed adults with skulls at Lod (Banning 1998:224). Fragments of adults and a child were found below a floor at Nizzanim, but little more can be determined from them (Banning 1998:224).

The chipped stone industry at Jericho IX sites resembles that of many other LN sites. Dominated by flakes, with no bipolar cores, it consists of the same bifacial knives, tabular scrapers and Haparsa, Nizzanim and Herzliya points as Yarmukian assemblages (Gopher 1995:220). The sickle-blades, however, are trapezoidal and curved as a result of bifacial pressure flaking (Gopher 1995:220).

Jericho IX pottery is also hand-made, tempered with straw, and grass-smoothed, like Yarmukian pottery (Garstang, et al. 1936:78). Many sherds indicate inadequate firing, though near the end of the LN period the firing technique becomes more thorough. Characteristic Jericho IX sherds are identified as having a cream slip with geometric patterns in burnished red paint over the slip (Garfinkel 1999a:95). Since Garstang's excavations in the 1930s and Kenyon's in the 1950s, the pottery from Jericho has been reassessed in order to clarify the stratigraphy and chronology (Garfinkel 1999a:69-73), the results of which have identified Jericho IX pottery that also is decorated using red slip, and incision, including herring-bone patterns (Garfinkel 1999a:95).

2.3.3 WT-40 Material Culture

WT-40 is located on an alluvial terrace along the western bank of the Wadi ath-Thamad approximately 20 km southeast of Madaba, Jordan. Currently, understanding of the material culture is based primarily on the 2004 excavation of the site, occasionally supplemented by its survey and 2001 test excavation. The three 6x6 m excavation units all revealed architectural remains as well as mud plaster surfaces. A definite lack of art objects has been observed in the excavation of the site thus far, but the presence of a primary burial within one of the structures demonstrates an ideological component in the function of the site. The chipped stone assemblage from WT-40 is flake-dominated, similar to other early LN sites in the Levant. The pottery is characteristic of the LN and appears to exhibit traits of both Yarmukian and Jericho IX assemblages.

The survey of WT-40 indicates the possible existence of rectilinear, circular and apsidal stone structures. Excavation revealed rounded walls constructed from rough stone and mud mortar, and very large stones resting on a smaller stone foundation. A detailed description of the architecture from WT-40 is provided in chapter 4. The surface inspection and preliminary excavations indicate that this site has the potential to yield a variety of architectural styles.

The role of ideology in the function of WT-40 is still uncertain. No anthropomorphic figurines or incised pebbles were discovered during the 2004 excavation of WT-40. However, a clay rod was found which resembles the so-called "phallic" objects recovered at Sha 'ar Hagolan and Munhata (Garfinkel 1993:121; 1999b:28-29). On the other hand, a burial was discovered capped by a thin layer of lime plaster and beneath the interior surface of one of the structures. The flexed body

represents the primary burial of an adolescent orientated north to south, its skull intact, with no grave goods. The immediate characteristics of this burial are obviously similar to the ones reported from Sha 'ar Hagolan, Habashan Street and Munhata. This body then may represent the sixth Yarmukian burial discovered.

The preliminary analysis of the chipped stone collection from WT-40 indicates that it is a LN site (Cropper 2002:82; Cropper, et al. 2003:19). It appears to be flake-dominated and contains Haparsa points and tile knives characteristic of this time period (Cropper 2002:82; Cropper, et al. 2003:18). Analysis of the formed tools from the 2001 test excavations revealed that awls and drills, including drill bits on spalls, were the most common tool category (Cropper, et al. 2003:18). The lithic assemblage from the 2004 season is still under analysis. Unfortunately, the only sickle-blade discovered in 2004, albeit denticulated, was found during surface collection and has no definite provenience.

The pottery from WT-40 demonstrates many LN characteristics. For instance, it is hand-made and primarily organic tempered. Some sherds exhibit poor firing. A few sherds appear to be grass-wiped and one sherd has been identified as a piece of a Byblos jar (Cropper, et al. 2003:17). A variety of decorative techniques are recognized, including framed herring-bone incision, slipping, painting and burnishing. The recognition of framed herring-bone incision as a so-called *fossile directeur* immediately suggests that the site should be affiliated with other Yarmukian sites, but the characteristic decoration of Jericho IX assemblages, burnished red painted patterns over a cream slip, is also present at WT-40. At present, an interesting contradiction is recognizable through the pottery assemblage from WT-40.

2.4 Discussion

A definite shift in settlement pattern, site size, and subsistence strategy occurred with the beginning of the LN. The number of sites, along with their distribution and size, appears to have decreased significantly coinciding with an increased reliance on cultivation and pastoralism during this period. Current research suggests the existence of two pottery typologies for the early LN in the southern Levant, Yarmukian and Jericho IX. Although a number of radiometric dates have been obtained from Yarmukian sites, like Sha 'ar Hagolan and Munhata, no radiometric dates have been established from any Jericho IX sites (Garfinkel 1999c:10). As a result, the chronology of these two assemblages remains uncertain. Similarity in chipped stone industries and forms of vessels can be utilized to propose contemporaneity (Garfinkel 1993:130). The geographic dispersion of the sites can also imply that they existed in separate regions contemporaneously (Garfinkel 1993:130).

Assuming the distinctions between the typologies are valid, identifying WT-40 as one type of assemblage or the other should be straightforward. According to the diagnostic framed herring-bone incised pottery decoration, WT-40 could be classified as Yarmukian. Conversely, the appearance of burnished red painted decoration over cream slip in the WT-40 assemblage shows affinity with Jericho IX ware. The environment of site WT-40, specifically its southern location outside of the Mediterranean climate zone, is also typical of Jericho IX sites. The current lack of denticulated sickle-blades and art objects makes WT-40 appear as an anomaly within the Yarmukian typology. Garfinkel (1993) states that the differences in style of Yarmukian and Jericho IX pottery decoration are the only variation between the two assemblages, yet the degree of overlap of their characteristics, visible at sites like WT-40, is generally overlooked. The

discrepancies encountered when attempting to classify WT-40 clearly demonstrate that the Yarmukian and Jericho IX typologies are incomplete and not as distinctly separate as they have been described.

CHAPTER 3

METHODOLOGY

3.1 Introduction

The excavation of WT-40 was conducted according to the guidelines of the Wadi ath-Thamad Archaeological Project (Daviau 1995). In 2001, the survey team excavated WT-40 and WT-96 in 1x1 m test probes employing a locus system in order to sample the sites (Cropper 2002:46). The units were intentionally located in areas with higher potential of producing a sufficient sample of artifacts (Cropper 2002:46). All sediment was screened using ¼ inch mesh, with the exception of Units 1 and 2 at WT-40 where 1 mm mesh was used to facilitate the recovery of microliths (Cropper 2002:46). All seven test probes were manually backfilled at the end of the season.

Upon returning in 2004, the team's strategy changed from excavating at both sites again to primarily focusing salvage excavation efforts on WT-40; as a result of a Bedouin camp directly on top of WT-96 and an attempt at cultivation, evidenced by a large cut down the northern slope and through WT-40. An overall grid was established for the area incorporating WT-96, WT-104, WT-40 and any other sites or find spots in the region. WT-40 and WT-104 were excavated using 6x6 m units with two 1 m balks. All of the units were placed with the intent of clarifying features visible from the surface. Two excavation units were opened at WT-104 (C64 and C75) to

investigate a substantial curved wall line and three units at WT-40 (A47, A53, and A54) examined a possible pit and curved wall lines. Units C64 and C75 at WT-104 were closed early, and backfilled, subsequent to the exposure of bare surfaces.

To maintain stratigraphic control, the soil loci were initially excavated in 10 cm increments, unless a natural change in soil composition occurred prior to that depth. Due to the extent of the colluvial debris covering WT-40, the arbitrary levels were changed to 30 cm, and then quickly became based solely on the natural stratigraphy. A ¼ inch mesh screen was used to sift all of the sediment excavated to retrieve as many artifacts as possible. As a result of the large proportion of lithics to pottery recovered during the 2001 test excavation, each locus was assigned a lithic pail number to which all other artifacts found in that locus can be correlated. The top and bottom elevations above sea level were measured for each locus using a transit or a total station and were recorded on a corresponding 1:50 top plan (Daviau 1995:21-23). These top plans also mapped all *in situ* artifacts, features and installations that appeared in that given locus, including vertical elevation above sea level and the precise horizontal measurements, which were obtained through triangulation (Daviau 1995:24).

Each locus, whether representing soil, architecture, or installation, was recorded according to its identification, recognition, description, stratigraphy, elevations, lithic pails, objects, photographs, possible biodata samples, drawings, and interpretation (Daviau 1995:35). A photograph was taken of the surface of each locus, any *in situ* artifacts or artifact clusters, as well as the final excavation surface of each unit at the end of the season. Upon completion of excavation, a scaled vertical section drawing was made of at least one wall profile within each unit at WT-40 prior to the strategic, manual backfilling of all three excavation units.

3.2 Analysis of WT-40 Ceramics

Within a laboratory setting, the pottery from WT-40 was vigorously but carefully cleaned to remove a layer of calcium carbonate that coated the surface of many of the sherds. This type of encrustation is caused by water moving over the limestone bedrock and dissolving calcium carbonate. The water then leaches through the ground soils and deposits the dissolved calcium carbonate on relatively porous items within the ground, in this instance pottery. The diagnostic and decorated pieces were registered according to the Wadi ath-Thamad Archaeological Project laboratory manual, which included a sequence of letters and numbers relating to the site, the field and unit, the lithic pail number, and the sherd number (e.g. WT40·A47·3·1). Following cleaning and cataloguing, the potsherds were divided according to diagnostic features, such as rim, base, handle, indicative or decoration, and analyzed based on Garfinkel's established pottery typology. Additional qualities concerning the method of vessel construction were also included to provide a more detailed description and inclusive comparison. The data collected was then quantified and analyzed statistically to accommodate a detailed comparison with the Sha 'ar Hagolan pottery assemblage and facilitate future studies.

3.2.1 Existing Typology

The typology employed in this study is based on the typological framework established by Garfinkel for Sha 'ar Hagolan, as adapted from the Munhata typology through the addition of a greater number of types (Garfinkel 1992; 1999a; Garfinkel and Miller 2002). The focus of this typology is on the open or closed form of the vessel, shape, size, and, occasionally, decoration (Garfinkel and Miller 2002:87). To acquire the

characteristics necessary to define the types, particular attention was paid to rim sherds, with the use of some indicatives such as shoulders and necks. The Munhata type numbers, consisting of a letter to designate class and a number to refer to type, were used in combination with the additional type numbers created for the Sha'ar Hagolan assemblage (Garfinkel and Miller 2002:87). The vessels represented are divided into six main classes:

A small open vessels	D medium-sized closed vessel
B small closed vessels	E large open vessels
C medium-sized open vessels	F large closed vessels

The size is delineated by diameters less than 10 cm, 10- 20 cm, and greater than 20 cm, respectively (Garfinkel 1999a:21). The orifice radius and the percentage factor of each rim sherd was measured and recorded from a standard rim chart to identify vessel and sherd size for numerical analysis purposes (Egloff 1973:353). According to exact shape and decoration, the classes are subdivided into 19 clear types and 3 varia (Garfinkel 1999a:21; Garfinkel and Miller 2002:88-95) (Figure 3.1):

A1 small bowl or cup	D1 Sha 'ar Hagolan jar
A2 small chalice	D2 Jericho IX jar
A3 spoon	D3 various medium-sized jars
B1 miniature jar	E1 pot
B2 small jar	E2 large bowl
B3 goblet	E3 basin
C1 deep decorated bowl	E4 pithos
C2 deep undecorated bowl	F1 holemouth jar
C3 bowl with large handle	F2 large Sha 'ar Hagolan jar
C4 large chalice	F3 handleless jar
C5 various bowls	F4 various jars

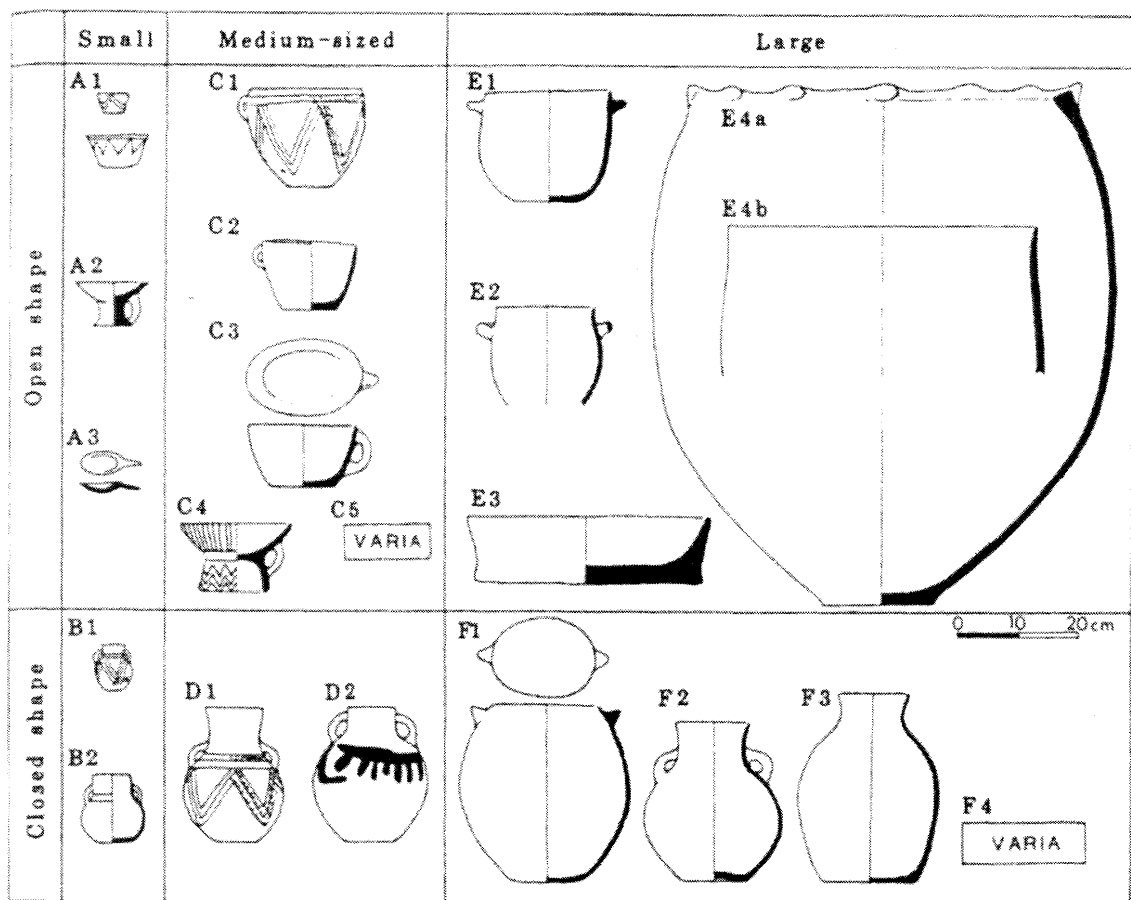


Figure 3.1. Typological chart of Yarmukian pottery (after Garfinkel 1992:33).

The minimum number of vessels was not counted owing to its inapplicability to Neolithic pottery assemblages. The variable nature of a rim throughout the circumference of the vessel skews the results of a straightforward count of rim sherds, providing an unrepresentative number of actual vessels present. However, mendable rim sherds were counted as one item and the percentage factor was utilized to prevent skewing of the data, eliminating sherds that did not represent a large enough portion of the vessel while including small rim sherds as long as they represented a significant percentage of the overall vessel.

Along with the Sha 'ar Hagolan typology, examination of additional typological features, including handles, bases and decoration, was undertaken and recorded to further the analysis beyond primarily rim sherds. At Sha 'ar Hagolan handles were identified by their characteristics as either loop, lug, pierced, or tubular (Garfinkel and Miller 2002:95). Bases were categorized as flat, disk, chalice, convex, ring, mat impressed, or rounded (Garfinkel and Miller 2002:95). The kinds of decoration distinguished included red slip, burnishing, wide painted lines, thin painted lines, herring-bone incision, frame incision, other incisions, and other decorations, which constituted plastic and impression techniques (Garfinkel and Miller 2002:97-100). A further description of these additional features is presented in the subsequent chapter with particular reference to the WT-40 pottery assemblage.

3.2.2 Additional Characteristics

Unfortunately, Garfinkel's (1999a, 2002) focus on the form of the vessel, shape, size, and decoration results in an incomplete typology. The stylistic study is supplemented here with additional vessel qualities, as listed below, which have not been

considered adequately in past research. The intention behind elaborating on the original typology is to achieve a more detailed description of the pottery assemblage from WT-40 in order to facilitate its interpretation and comparison to other LN sites, as well as to determine the relationship between Yarmukian and Jericho IX pottery assemblages.

The additional aspects of this study involve a detailed examination of the method of vessel construction. Though allowed certain artistic liberties, the potter is bound by the needs and customs of the culture, which will consciously and subconsciously influence his or her choices in the process of constructing a vessel. The forming process itself may be related to the personal preferences of the potter but could also be dictated by the technology and expectations of the culture. Therefore it has been identified whenever possible. The thickness of the ware was measured to initiate a standard procedure useful for comparative purposes. Thickness of the walls relates to the size of the vessel and its intended function, which implies decision-making on the part of the potter (Rice 1987:227). These decisions provide insight into the society in which the potter lives. The temper and inclusions were macroscopically examined and recorded. The degree of firing was examined through visible changes in colour to recognize possible differences or changes in technique. Sherds were identified as oxidized if all of the carbons appear to be burned out, and underfired if incomplete oxidization of the carbons has left a dark core in the cross section of the sherd (Rice 1987:88). Smokeclouds from firing were also noted to identify any possible reducing atmospheres during firing as well. Refiring tests were not attempted owing to their inaccuracy in replicating the original uncontrolled and variable conditions of non-kiln fired sherds (Rice 1987:345). Finally, the finishing procedures were examined and compared.

Adding these further characteristics will also promote precision in this analysis and facilitate future studies of the data.

3.2.3 Statistical Analysis of WT-40

The quantitative data produced through study of the pottery from WT-40 is analyzed statistically as well. First, a variety of descriptive statistics have been calculated for the WT-40 ceramic assemblage as a whole. These descriptive statistics perform two main functions, describing the assemblage overall and permitting precise comparison quantitatively. The total number and the representative percentage of the collection were determined for each kind of diagnostic sherd (rim, base, handle, indicative and decoration), each type of vessel from Garfinkel's typology, both fine and coarse wares, and each style of decoration. In addition, the percentages of sherds representing a variety of ranges of thicknesses were computed and related to their respective degree of firing. The percentiles for the site were calculated for the temper and inclusions, the degrees of firing and the recycled sherds.

Inferential statistics were also used to assess the reliability and significance of the differences which could exist between the potsherds collected from each excavation unit at WT-40 (Sinopoli 1991:185). The decorative data from below the colluvium in each unit at WT-40 was compared using an analysis of variance or ANOVA test. An ANOVA test allows the simultaneous comparison of two or more samples and will estimate whether the variability is greater among the samples or within the samples of data (Sinopoli 1991:193). Decoration was chosen for this comparison since vessel form can be directly influenced by the function of the pot, and Garfinkel's characteristic distinction between LN pottery assemblages is so firmly embedded in decorations. The

null hypothesis (H_0) for this test proposes that all samples were obtained from the same population or data set (Sinopoli 1991:196). For each sample a sum of squares was calculated:

$$SS_i = \sum y_i^2 - \frac{(\sum y_i)^2}{n_i} \quad (3.1)$$

A variance is obtained by dividing the sum of squares by the degrees of freedom (df):

$$s_i^2 = \frac{\sum y_i^2 - \frac{(\sum y_i)^2}{n_i}}{n_i - 1} \quad (3.2)$$

The total sum of squares (SS_{total}) is then estimated and separated into the amount of variation within the groups (SS_{error}) and amount of variation between groups (SS_{among}). Two mean squares (MS_{error} and MS_{among}) were determined by dividing SS_{error} and SS_{among} by the corresponding degrees of freedom. The equations for these calculations are presented in Table 3.1. The F ratio was calculated by dividing MS_{among} by MS_{error} . If the F ratio is equal to or greater than the critical value then H_0 is rejected, and the samples are not from the same population (Shennan 1997:88). If the null hypothesis is rejected the Scheffe test is performed to determine which of the samples differs. This test is similar, only it is performed on two groups at a time, and it eliminates the possibility of incorrectly rejecting a true null hypothesis. $SS_{between}$ is calculated:

$$SS_{between} = \frac{(\sum y_i)^2}{n_i} - \frac{(\sum \sum y)^2}{\sum n} \quad (3.3)$$

The result is divided by df_{among} to give $MS_{between}$ which is divided by MS_{within} to give the F ratio. The F ratio is compared to the critical value (p) to determine if H_0 is rejected or not (Shennan 1997:88-89). If F is greater than or equal to p then H_0 can be rejected and

one of the samples is not from the same population. The results of this test will be displayed in the format of an ANOVA table, similar to Table 3.1.

Table 3.1 Format of an ANOVA Table.

Source of Variation	df	SS	MS	F	p
among	a-1	$\sum \frac{(\sum y_i)^2}{n_i} - \frac{(\sum \sum y)^2}{\sum n}$	$\frac{SS_{among}}{a-1}$	$\frac{MS_{among}}{MS_{error}}$	
within	$\sum n - a$	$SS_{total} - SS_{among}$	$\frac{SS_{error}}{\sum n - a}$		
total	$\sum n - 1$	$\sum \sum y^2 - \frac{(\sum \sum y)^2}{\sum n}$			

In these equation a equals the number of samples, n equals each sample size, and p is the critical value determined from the F ratio table (Shennan 1997:418-419). This combination of tests will determine if the ceramic collections from each unit at WT-40 came from the same site assemblage.

3.3 Comparative Analysis

The qualitative and quantitative data relating to the pottery from WT-40 are then systematically compared with those of other LN sites, in particular the Sha 'ar Hagolan pottery assemblage, in an effort to situate WT-40 within the period. First, the assemblage from WT-40 is tested to identify if it is a representative sample in comparison to the much larger sample from Sha 'ar Hagolan. To prove this ascertain, the percentages of diagnostic sherds from WT-40 would have to be relatable to those

discovered at Sha 'ar Hagolan. Next, statistical analyses are implemented to directly compare the totals of each kind of decorated sherds between the WT-40 assemblage below the colluvium and the Sha 'ar Hagolan assemblage. A two-sample ANOVA test was used for this purpose. The null hypothesis states that the two assemblages are from the same population. The same procedure as described above is implemented, in this case with the number of sherds with red slip, burnishing, wide painted lines, thin painted lines, herring-bone incision, frame incision, other incisions, and other decoration to determine if there is significant variation between the decorated assemblages from WT-40 below the colluvium and Sha 'ar Hagolan. The results of the analysis performed will be displayed in a table similar to Table 3.1. If the assemblages are found to differ it would suggest that different socio-cultural conditions occurred at WT-40, whereas if the assemblages are discovered to be inherently similar, then the Yarmukian versus Jericho IX pottery typology will demand greater clarification.

The WT-40 material cultural assemblage, other than ceramics, is briefly contrasted and compared to those of typical Yarmukian and Jericho IX sites, including Sha 'ar Hagolan (Stekelis 1972; Garfinkel 1992, 1999a; Garfinkel and Miller 2002), 'Ain Ghazal (Rollefson and Simmons 1987; Kafafi 1990; Rollefson 1993), Abu Thawwab (Gillet and Gillet 1983; Obeidat 1995), Munhata (Gopher 1989), Jericho (Garstang, *et al* 1935, 1936; Kenyon and Holland 1982, 1983), and Yiftah'el (Braun 1997). Emphasis is placed on the characteristic qualities of the two LN assemblages as well as the degree of similarity visible through the overlap of various traits. From the comparison and the data from WT-40, the LN ceramic typologies are reassessed for their validity.

CHAPTER 4

ANALYSIS OF THE WT-40 CERAMICS

4.1 Context

The three units excavated at WT-40 are all located in Field A and consist of squares 47, 53, and 54 (Figure 4.1). A47 lies approximately 13.42 m south-east of A54, whereas A53 is directly adjacent to the north of A54. All three units are capped by a layer of colluvium ranging in thickness from 0.10 m to 0.60 m. Colluvium is a mixture of soil and unconsolidated rock fragments deposited at the base of a slope, usually caused by a massive wet period following a drier climatic period (Trenhaile 1998:71). Rossignol-Strick (1993) argues that this climatic change would have occurred by around 6,000 B.P. (Banning 1998:200). In the case of WT-40, the colluvium seals the site suggesting that the material culture below this layer should be relatively undisturbed.

Unit A47 (Figure 4.2) contained 1.0 m northern and eastern balks and was excavated to a maximum depth of 0.89 m. The excavated portions of A47 uncovered a round structure constructed from rough stones and mud mortar and larger stones sitting on a foundation of smaller stones. Separate mud plaster surfaces were discovered on the interior and exterior of the architecture. Beneath the center of the interior surface, a thin layer of lime plaster marked the boundary of a primary burial of an adolescent. The only objects found below the colluvium in this unit were fragments of a limestone bracelet and marble bead from the interior of the structure.

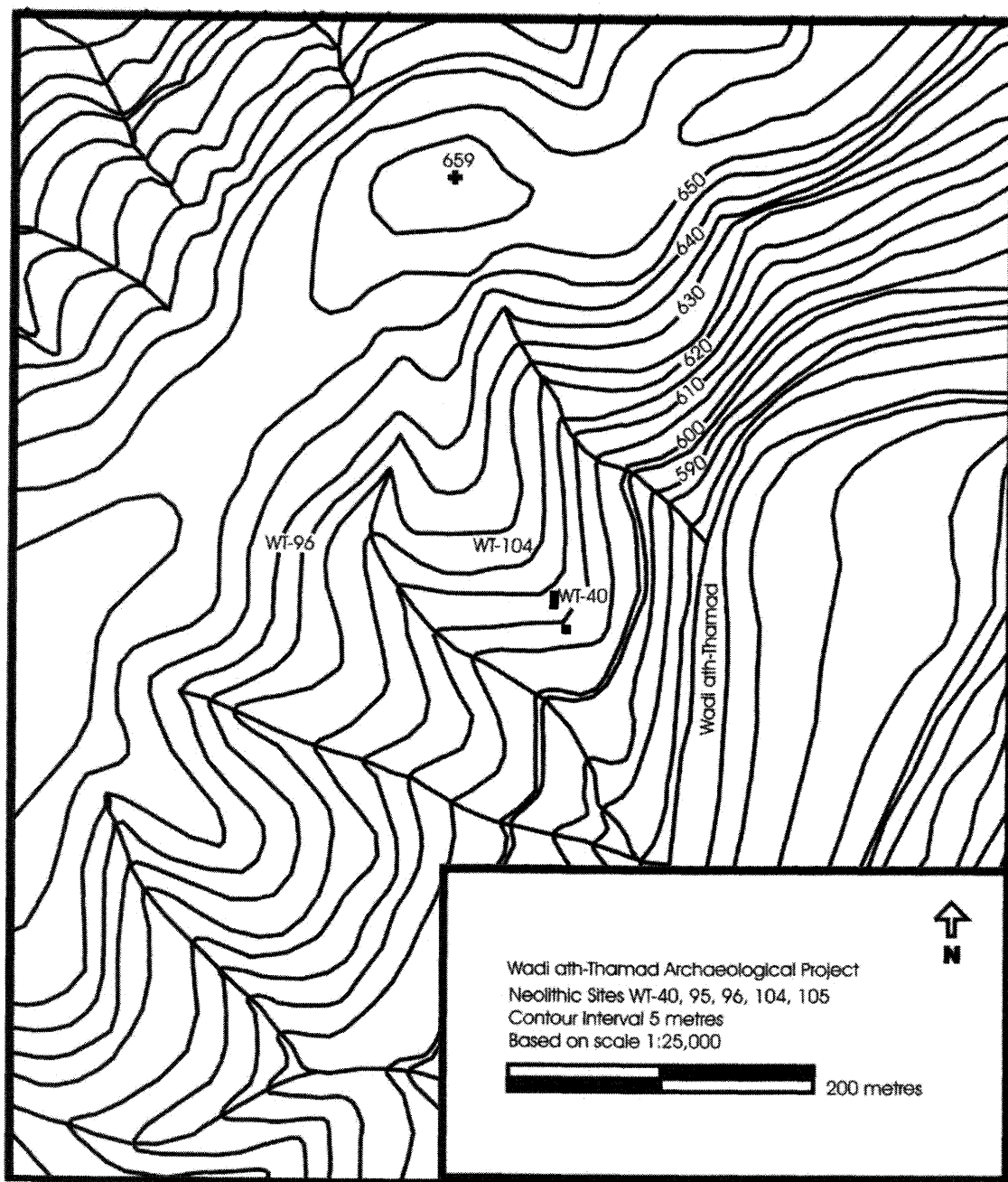


Figure 4.1. Contour map illustrating the location of Wadi ath-Thamad sites and the 2004 excavation units at WT-40 (Foley and Dunn 2006).

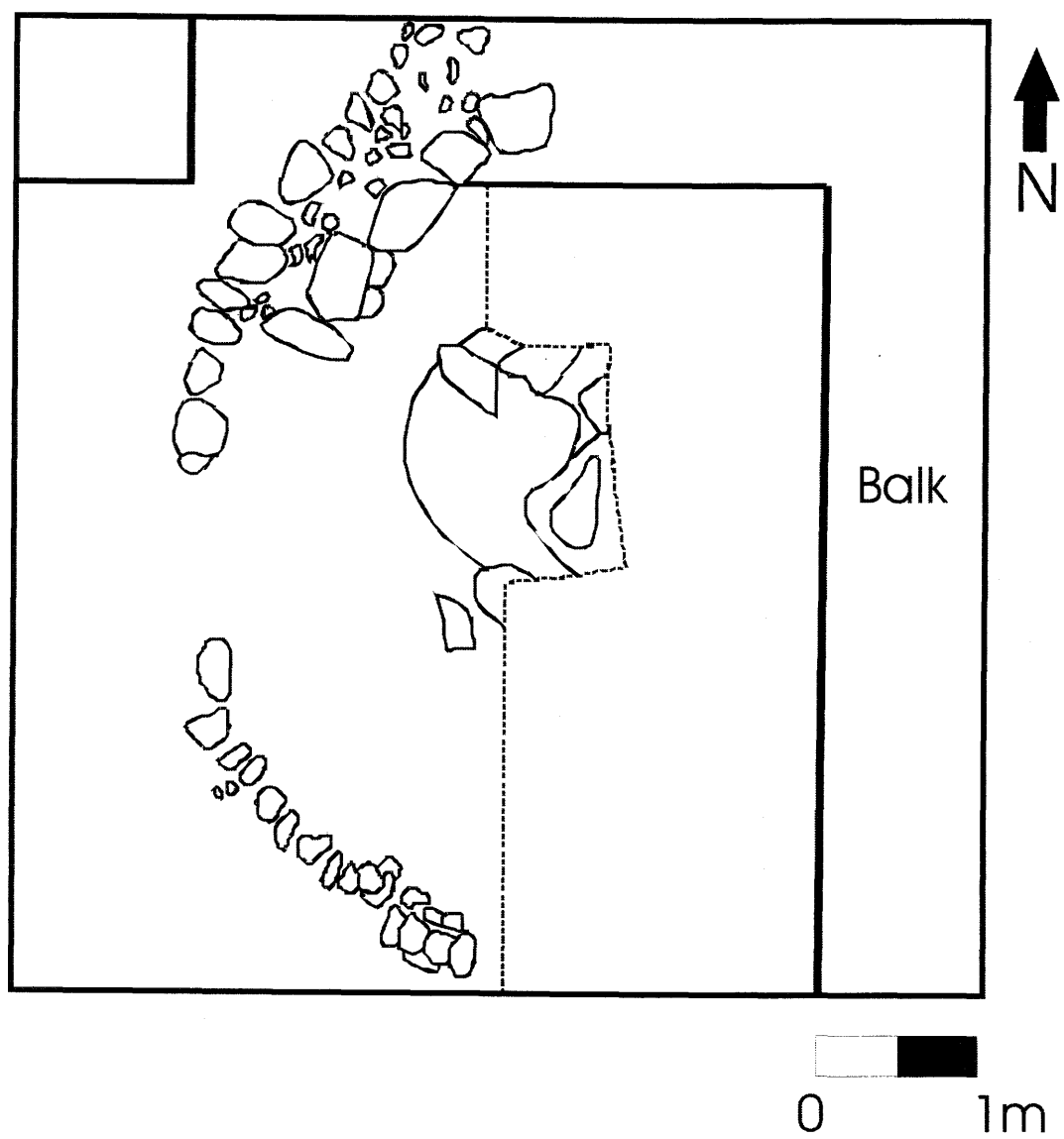


Figure 4.2. Top Plan of Unit A47 from WT-40.

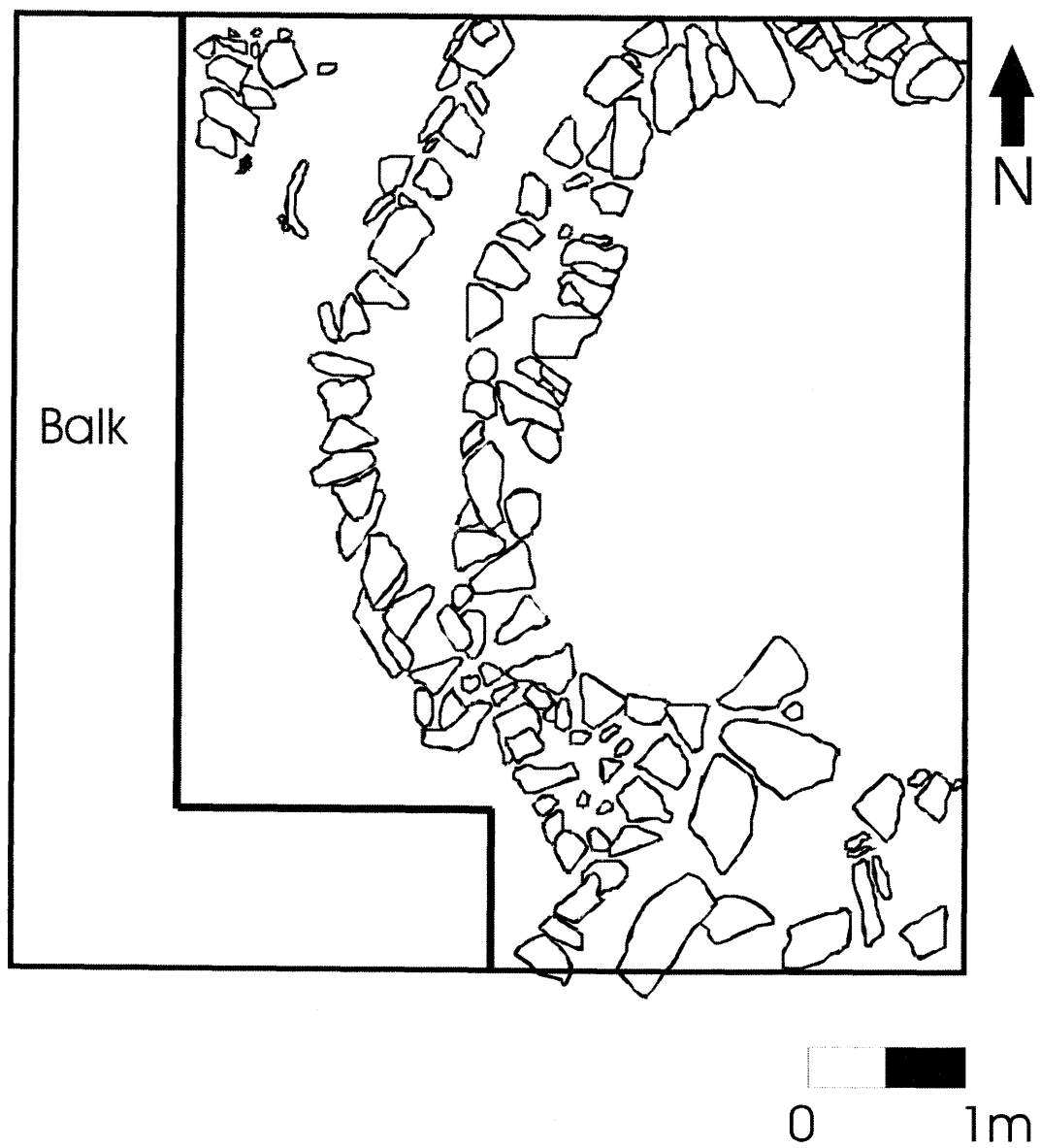


Figure 4.3. Top plan of Unit A53 from WT-40.

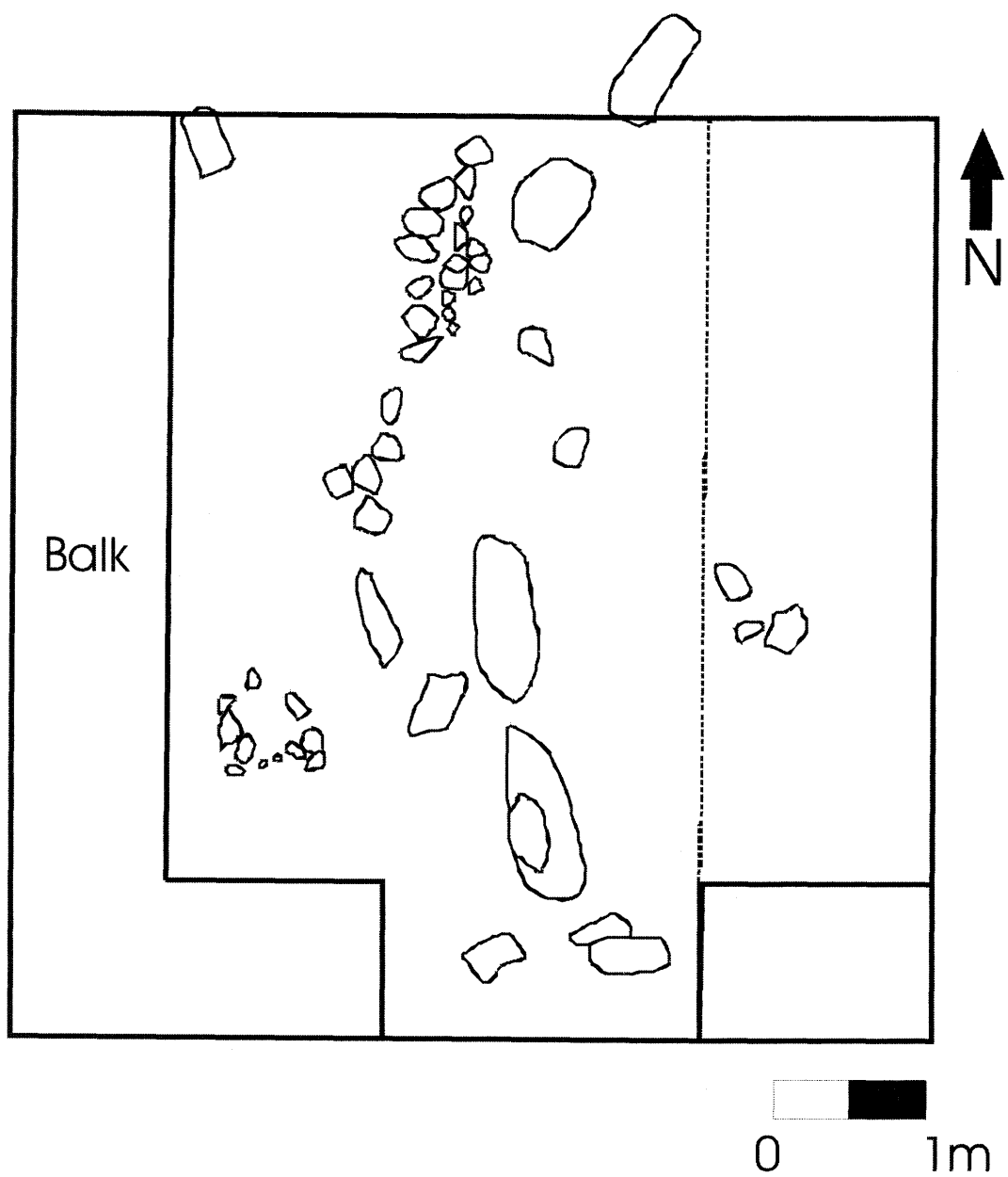


Figure 4.4. Top plan of Unit A54 from WT-40.

Both A53 (Figure 4.3) and A54 (Figure 4.4) were excavated with 1.0 m southern and western balks. A53 was excavated to a maximum depth of approximately 1.28 m, while a maximum depth of 0.89 m was reached in A54. Units A53 and A54 revealed curved stone walls, constructed in a similar fashion to the ones in A47, which join at the balk where the two units meet. Mud-plaster surfaces were found in A53 on the exterior and interior, as well as in between the two walls. A fragment of a bone needle was discovered between the two walls, while a chert Haparsa projectile point was found in the north-western corner outside of the walls. A54 contained a small rough stone wall on the exterior of the entrance through a very large stone wall, with stones measuring over meter long and half a meter high resting on a small stone foundation. Fragmentary mud-plaster surfaces are located on the exterior and interior of the walls, with a small hearth in the south-western exterior corner of the unit. Within the interior of the structure a fragment of a pestle and a clay rod were found, as well as a wooden comb near the "doorway".

4.2 General Description

The three units excavated at WT-40 produced a total of 711 potsherds, 650 or 91.42 % of which have a LN association. Separated by unit, A47 yielded 275 sherds, 86.55 % or 238 of which are identifiably LN. On the other hand, 94.58 % or 279 sherds of the 295 found at A53 are LN, and A54 generated 133 LN sherds comprising 94.33 % of the 141 sherds discovered in the unit. As previously mentioned, the formation processes involved at the site have left it capped by a layer of colluvial debris. Theoretically, the ceramics below the colluvium are directly related to the actual occupation of the site. Therefore, they should provide more accurate information about

WT-40 specifically, while the sherds within the colluvium will only provide information relative to sites in the surrounding area such as WT- 104. Below the colluvium, 366 LN sherds were found, 152 from A47 (41.53 %), 169 from A53 (46.17 %), and 45 from A54 (12.30 %). Only four sherds from below the colluvium do not have a LN association. They are believed to represent cases of accidental contamination. Upon arrival to the University of Saskatchewan four LN sherds were also missing which is accounted for in the percentage calculations of indicative sherds below the colluvium.

Three distinct clay colours are recognizable in the LN ceramic assemblage at WT-40, cream, reddish, and white, indicating that at least three clay sources were utilized. However, all three clay types exhibit a variety of temper and inclusions depending on the vessel. Limestone, basalt, or chaff can be found as the sole inclusion as well as mixtures to varying degrees. The various vessel shapes and forms are also not restricted to only one clay type, but are found across all three clay types. When it appears, the diversity of decoration is not affected by the type of clay, with the exception of the rare appearance of red paint on white clay vessels.

4.3 Typological Description

In accordance with Garfinkel's analysis of the Sha 'ar Hagolan pottery the primary typological description of the WT-40 assemblage is based on indicative sherds. The LN assemblage from WT-40 includes 115 indicative sherds (17.80 %) of the 650 LN sherds collected. These can be divided into the following elements: 52 rim sherds (8.05 %), 24 bases (3.72 %), 20 handles (3.10 %), and 34 "indicative sherds, not rims" like shoulders and necks (5.26 %) (Table A-2). Below the colluvium are 68 indicative sherds (18.78 %) of the remaining 362 LN sherds, including: 32 rim sherds (8.84 %), 11

bases (3.04 %), 11 handles (3.04 %), and 21 “indicative sherds, not rims” (5.80 %) (Table A-3). Some of the sherds from WT-40 are mendable, thus the assemblage represents a total of 573 items with 232 items from below the colluvium. The LN items from WT-40 represent 13 of the 19 clear type categories but none of the three varia (types C5, D3, and F4) defined by the Munhata typological framework and elaborated on by the Sha ‘ar Hagolan assemblages (Garfinkel and Miller 2002:88-95) (Table A-1). In one instance a new type number was created and added for a form which had not been found at either Munhata or Sha ‘ar Hagolan, which will be described below (Type A4). The types are divided into six classes based on size and open or closed form. Each vessel type represented by the WT-40 pottery assemblage is listed with the total number of items of that particular type found at the site, including its percentage of the total typologically diagnostic items (47 items), and the number of items of that type found below the colluvium, as well as its percentage of typologically diagnostic items (29 items) from below the colluvium.

4.3.1 Class A Small Open Vessels

Class A is defined as vessels with a diameter of less than 10 cm which display an open form (Garfinkel 1999a: 23; 1993: 34). This represents 10 items, 6 of which were located below the colluvium. The small open vessels are divided into four types.

A1- Small Bowl or Cup 9 (19.15 %), 6 below colluvium (20.69 %) (Figure A-1)

The small bowls and cups in this assemblage have relatively thin walls with rounded or pointed rims. These vessels are spheroid or ellipsoid in shape, as represented by relatively shallow or flared bowls and deep cups with upright walls. One vessel demonstrates a slight rounded shoulder (WT40-A54-52-2). Half of the vessels are

slipped or painted, while the other half are undecorated. Garfinkel includes small cups with a miniature pierced handle at the rim in this category (Garfinkel 1992:34; 1999a:23). Two such handles were found at WT-40 within the colluvial layer (WT40-A47-32-1 and 2).

A2- Small Chalice and A3- Spoon

No small chalices or spoons are present in the current assemblage from WT-40. However, a few very small, delicate loop handles are identified which may have constituted part of a chalice at one time but this can not be determined definitely.

A4- Small Plate or Basin 1 (2.13 %)

A new type number was added to account for the small plate/ basin discovered at WT-40 (WT40-A47-31-1). It consists of a flat base, walls that curve slightly outward, and a pointed rim. The walls are as high as the base is thick, approximately 0.60 cm. Both the interior and exterior are cream slipped, with a thicker slip occurring on the interior.

4.3.2 Class B Small Closed Vessels

Class *B* represents closed vessel forms with a diameter less than 10 cm (Garfinkel 1999a:20). In total, 8 items from the WT-40 assemblage fall into this category, 5 from below the colluvium. All three types of this class are present at the site (Figure A-2).

B1- Miniature Jar 3 (6.38 %), 2 below colluvium (6.90 %)

Vessels in this category have a diameter less than 7 cm and appear to be miniature versions of the "Sha 'ar Hagolan jar" (type D1 described below) (Garfinkel 1993:35; 1999a:43; Garfinkel and Miller 2002: 92). These vessels have a rounded rim, a

neck leading to a spherical body and, generally, a flat base (Garfinkel 1999a:43). Miniature jars usually have two handles which attach at the neck and shoulder (Garfinkel 1999a:43). However, only one pierced handle has been recovered at WT-40 from this category (WT40-A47-32-2). The vessels in this category from the WT-40 assemblage are decorated with red slip, red paint, or have no decoration, but the Sha 'ar Hagolan and Munhata assemblages also include incision (Garfinkel 1992:35; 1999a:43; Garfinkel and Miller 2002:92).

B2- Small Jar 4 (8.51 %), 2 below colluvium (6.90 %)

A small jar is characterized by a diameter of 8-10 cm with a similar shape to the "Sha 'ar Hagolan jar" (type D1) as subsequently described (Garfinkel 1992:35; 1999a:43; Garfinkel and Miller 2002:92). The items of this type from WT-40 exhibit a variety of decorations including cream slip, red paint, and framed herring-bone incision, as well as an undecorated loop handle.

B3- Goblet (b)1 (2.13 %), 1 below colluvium (3.45 %)

This vessel is a closed form similar to a holemouth jar. It has relatively thin walls, a rounded rim, no handles, and a globular shape (Garfinkel and Miller 2002:92). Garfinkel has identified two variants of this type, *B3a* which is very closed with a simple opening and *B3b* which has a rim that slightly rises distinguishing the lip (2002:92). Goblets can be decorated with red paint or red slip, but they do not appear with incised decoration. Accompanying the decorated items are specimens which exhibit thorough surface treatment such as burnishing, but are undecorated. The example from WT-40 is of the *B3b* variety whose exterior is finished with a wide line of red paint as well as a burnished cream slip (WT40-A53-15-1).

4.3.3 Class C Medium-Sized Open Vessels

Open formed vessels with a diameter that falls within the range of 10 to 20 cm comprise Class C (Garfinkel 1999a:20). Thus far, WT-40 has supplied 13 items of this variety, 6 discovered below the colluvial layer. Three of the four types in this class are represented at WT-40. (Figure A-3)

C1- Decorated Bowl 6 (12.77 %), 4 below colluvium (13.79 %)

Vessels of this type are relatively deep, with the diameter of the vessel equalling its height (Garfinkel 1992: 36; 1999a: 25; Garfinkel and Miller 2002:90). The relatively thin walls are only slightly curved or upright, while the rims are rounded, pointed or square (Garfinkel 1992:36; 1999a:25; Garfinkel and Miller 2002:90). Occasionally, a small vertical loop handle is found near the rim of the bowl (Garfinkel 1992:36; 1999a:25; Garfinkel and Miller 2002:90), but no such examples are represented in the WT-40 assemblage. All of these vessels are decorated on the exterior and occasionally on the interior, either by incision, red paint, burnishing, and/ or slip. The common motifs found at WT-40 consist of a red paint line or "lipstick" rim, chevron pattern, thin lines, horizontal bands, and triangular panels. No herring-bone incised bowls have been discovered at WT-40 to date.

C2- Undecorated Bowl 6 (12.77 %), 2 below colluvium (6.90 %)

This type of vessel is similar in shape to type C1, but the walls are slightly thicker, their proportions are flatter, and they are not decorated (Garfinkel 1992:39; 1999a:29; Garfinkel and Miller 2002:91). The WT-40 assemblage is represented by rims that are rounded, pointed or square with a flat base. A common feature of these undecorated vessels is a grass-wiped or smoothed interior.

C3- Bowl with Large Handle 1 (2.13 %)

Also known as a mug, this type of vessel is a deep undecorated bowl with a large vertical handle that extends from near the rim down to around the base (Garfinkel 1992:39; 1999a:29). Larger fragments of this vessel found at Munhata indicate it has an ovaloid rather than spherical shape (Garfinkel 1992:39; 1999a:29). The example found at WT-40 has a large pierced handle, which was added separately to a smaller bowl. It is decorated with red paint on the interior and exterior, and is burnished on the exterior.

C4- Large Chalice

No items were found at WT-40 that can be identified as this type of vessel. The highly fragmentary state of the sherds from this assemblage did not facilitate the recognition of the presence or absence of a high and hollow base. The problem is methodological. It is virtually impossible to identify chalices accurately from rim fragments alone. A high and hollow base is the defining characteristic of this vessel type and if it cannot be recognizably associated with a rim, the possibility exists that that particular vessel's rim fragments may be categorized under a different type of vessel, resulting in statistical uncertainty for this and other classificatory types. However, a sherd was recovered at WT- 104 from unit C75 which may be part of a chalice base, though its damaged condition impedes a definite identification.

4.3.4 Class D Medium- Sized Closed Vessels

Vessels with a closed form and a diameter from 10 to 20 cm are allotted to Class D (Garfinkel 1999a:20). The 10 items discovered, 8 from below the colluvial debris, are representative of both of the main types in this category (Figure A-4).

D1- Sha 'ar Hagolan Jar 5 (10.64 %), 5 below colluvium (17.24 %)

This vessel type is considered very typical of Yarmukian assemblages, to the extent of being regarded as a *fossile directeur* (Garfinkel 1992:43; 1999a:45). Vessels of this type have a pointed or rounded rim, a high, slightly flared neck, two loop handles that extend from the neck to the shoulder, a sphere-shaped or oval body, and a flat or disk base (Garfinkel 1992:41; 1999a:43; Garfinkel and Miller 2002:93). All of these vessels are decorated by combinations of incision and red paint. The most common design is horizontal, framed herring-bone incision at the base of the neck accompanied by zig- zag or chevron lines encircling the body (Garfinkel 1992:41; 1999a:45; Garfinkel and Miller 2002:93). The neck may be decorated in a variety of styles, but the rim frequently appears with the "lipstick" motif (Garfinkel and Miller 2002:93). One example of this type found at WT-40 indicates that the rim and neck portion was made separately and then joined to the body to complete the vessel. A further description of surface additions is presented in the later discussion of construction techniques. The same vessel has a framed dash incision around the base of the neck, both of which are characteristics identical to those of a vessel found at Sha 'ar Hagolan (Garfinkel and Miller 2002:93, Fig. 7.31:3) (WT40-A53-13-2).

D2- Jericho IX Jar 5 (10.64 %), 3 below colluvium (10.34 %)

This type of vessel has received its name as a result of its frequent appearance within the Pottery Neolithic A Jericho assemblage (Garfinkel 1992:43; 1999a:49; Garfinkel and Miller 2002:93). It is recognized by a slightly shorter neck, a shoulder which may be relatively flat or sloping, two thicker loop handles, a rounded body, and a flat base (Garfinkel 1992:43; 1999a:49; Garfinkel and Miller 2002:93). With regards to decoration, these vessels are usually undecorated or contain a simple red paint or slip

pattern (Garfinkel 1992:43; 1999a:49). Although they have also appeared with herringbone incision, this kind of decoration is considered rare for this type of vessel (Garfinkel 1992:43; 1999a:49). All five items from this category in the WT-40 assemblage have rounded rims and are relatively thicker in construction than the *D1* jars. Most of these examples are undecorated, with the exception of one which has a “lipstick” rim.

4.3.5 Class E Large Open Vessels

Class *E* vessels have a diameter greater than 20 cm as well as an open form. All 3 items that fit into this category were found in loci below the colluvium (Figure A-5). The low representation of this class in the WT-40 assemblage may be the result of the limited excavation extent, impacting the number and variety of activity areas which have been sampled.

E1- Pot and E3- Basin

No pots or basins were identified from the WT-40 assemblage.

E2- Large Bowl 1 (2.13 %), 1 below colluvium (3.45 %)

This type of deep vessel is fairly rare at both Sha ‘ar Hagolan and Munhata (Garfinkel 1992:45; 1999a:36; Garfinkel and Miller 2002:91). It is usually decorated and can have horizontal handles (Garfinkel 1992:45; 1999a:36). In the case of the rim from WT-40, it has no apparent handles but has been painted red and burnished. It has relatively thin walls that slope inward and a pointed rim (WT40-A47-44-1).

E4- Pithos 1b and 1a (2.13 % each), 1b and 1a (3.45 % each) below colluvium

This storage vessel is characterized by its exceptionally large size and thicker walls. It has been sub-divided into two kinds: *E4a* holemouth pithos and *E4b* open pithos (Garfinkel 1992:46; 1999a:37; Garfinkel and Miller 2002:92). The body of a holemouth

pithos is ovoid, narrowing toward a small flat or convex base (Garfinkel 1992:46; Garfinkel and Miller 2002:92). A large variety of rims can be found on these pithoi from rounded or square to thickened into different shapes (Garfinkel 1992:46-47; 1999a:39). Just below the rim there may also be a row of lug handles at equal intervals around the vessel, but they are too small to be used to carry the vessel so it is suggested that they served to fasten a lid, or perhaps solely as decoration (Garfinkel 1992:46; 1999a:39; Garfinkel and Miller 2002:92). The vessel found at WT-40 has a square rim and a damaged section near the rim which may be the remains of a missing lug handle. In comparison, the open pithos has straighter walls leading toward the rim (Garfinkel 1992:47; 1999a:43; Garfinkel and Miller 2002:92). These vessels may also have lug handles, be red slipped, and may taper toward the base; however, no complete vessel has been recovered so the exact shape of the lower body remains unclear (Garfinkel 1992:47; 1999a:43; Garfinkel and Miller 2002:92). The open pithos discovered at WT-40 has thick walls (around 1.936 cm), a square rim, no lug handles, and is cream slipped (WT40-A47- 38-2).

4.3.6 Class F Large Closed Vessels

Closed form vessels with a diameter greater than 20 cm are assigned to Class *F*. The assemblage from WT-40 contains 3 items that satisfy these criteria, 1 of which was discovered below the colluvium. Only two of the three types are represented.

F1- Holemouth Jar 2 (4.26 %), 1 below colluvium (3.45 %)

Vessels of this type are neckless with rounded or pointed rims, two large lug handles and a flat or disk-shaped base (Garfinkel 1992:48; 1999a:50). Garfinkel (1999a)

divides this type into a) simple holemouth jar, b) holemouth jar/ krater, and c) holemouth jar with curved rim; however, the distinctions appear to be slight variations in the rim. The examples from WT-40 are decorated with burnished red paint, red slip, and one contains a horizontal incision near the rim.

F2- Large Sha 'ar Hagolan Jar

No large Sha 'ar Hagolan jars were found at WT-40.

F3- Handleless Jar 1b (2.13 %)

These vessels have straight or sloping shoulders, no handles, ellipsoid shaped bodies, and flat or disk-shaped bases (Garfinkel 1992:49; 1999a:54; Garfinkel and Miller 2002:94). The necks of this type can vary between a) high-necked and b) low-necked (Garfinkel and Miller 2002:95). The inclination of a high neck may be straight, expanding or converging, while a low neck is so low it gives the appearance of an outward turning rim (Garfinkel 1992:50; 1999a:57; Garfinkel and Miller 2002:95). The WT-40 assemblage contained an example of a low-necked handleless jar with red paint on the interior and exterior. The rim of this vessel is diagonal, increasing the appearance of curving outward (WT40-A54-16-2).

4.3.7 Handles 20 (3.08 % of all sherds), 11 below colluvium (3.04 % of all sherds below colluvium)

The handles recovered from WT-40 represent two of the four kinds found at Yarmukian sites. Garfinkel identifies loop, lug or knob, pierced, and tubular handles. However, only one tubular handle has been found at Sha 'ar Hagolan (Garfinkel 1992:53-54; 1999a:58-58; Garfinkel and Miller 2002:95). The WT-40 assemblage consists of loop and pierced handles, with a possible missing lug handle. Vertical loop

handles are the most prevalent at this site (18, 11 below colluvium) (Figure A-6). They are found in varying thicknesses and are occasionally flat and oval in section. The two pierced handles at WT-40 are relatively small vertical lug handles with a hole penetrating it through the middle. Unfortunately, no pierced handles were found below the colluvium.

4.3.8 Bases 24 (3.69 % of all sherds), 11 below colluvium (3.04 % of all sherds below the colluvium)

Garfinkel recognizes seven kinds of bases within Yarmukian assemblages: flat, disk, chalice, convex, ring, mat impressed, and rounded (Garfinkel and Miller 2002:95). All of these bases are comparatively smaller than the diameter of the vessel and they always join to the vessel wall at an obtuse angle (Garfinkel and Miller 2002:95). Flat bases appear most frequently at WT-40 (14, 7 below colluvium), followed by the disk (4, 2 below colluvium) and ring (5, 2 below colluvium), and one rounded base that was not found below the colluvium (Figure A-7).

4.4 Decoration 292 (44.92 % of total sherds), 169 below colluvium (46.69 % of total sherds below colluvium)

Garfinkel (2002) identifies eight different kinds of decoration demonstrated by the Sha 'ar Hagolan assemblage; 1) red slip, 2) burnishing, 3) wide painted lines, 4) thin painted lines, 5) herring- bone incision, 6) frame incision, 7) other incisions, and 8) plastic and impression decoration. A ninth kind of decoration, cream slip, is included in the study of the WT-40 assemblage to investigate its possible significance. Each kind of

decoration is listed with the number of items found exhibiting that particular kind, as well as the percentage of the 241 decorated items represented by that decorative technique followed by the number of items below the colluvium with that kind of decoration, including the percentage of the 150 decorated items represented by that kind of decoration.

4.4.1 Red Slip 55 (22.82 %), 33 below colluvium (22.00 %)

A slip is a fluid suspension of clay and water which is applied to a vessel to create a smooth surface (Rye 1981:20). A red slip may be found on the entire potsherd, including the exterior and/or interior (Garfinkel 1992:55; 1999a:59; Garfinkel and Miller 2002:97). Through the analysis of pot sherds it is difficult to determine whether an entire vessel was slipped or simply a portion. Therefore, both options are included in this category. All of the examples from WT-40 exhibit only a red slip with no kind of incised decoration.

4.4.2 Cream Slip 104 (43.15 %), 69 below colluvium (46.00 %)

Although Garfinkel does not include this category in describing the decorations at Sha 'ar Hagolan or Munhata, it has been added to describe the WT-40 assemblage because of the significance it is given by Garfinkel in reference to Jericho IX assemblages (Garfinkel 1999a:68). The application of a cream slip is described as the first stage of the decoration technique characteristic of Jericho IX assemblages (Garfinkel 1999a:96). The absence of this kind of decoration in reports on the Sha 'ar Hagolan and Munhata pottery assemblages, even in the discussion of type D2 Jericho IX

jars present at the sites, is interesting, particularly in light of the large percentage of sherds from WT-40 with cream slip.

Within the WT-40 pottery assemblage, this cream coloured slip can be found on the interior or the exterior of a variety of vessel types including primarily small and medium-sized bowls and jars. Occasionally, it is combined with framed herring-bone incision or red paint and can be grass-wiped or burnished. One example appears in which the cream slip is burnished but the red painted line is not, and one where the red painted design is burnished while the cream slip is not burnished. (WT40-A54-44-2) Unfortunately, since the WT-40 pottery assemblage is generally composed of potsherds which only represent portions of the vessels, the identification of solely cream slipped vessels from solely cream slipped sherds is questionable and therefore not attempted in this study.

4.4.3 Burnishing 29 (12.03 %), 17 below colluvium (11.33 %)

This kind of decoration is only discussed in the 2002 description of the Sha 'ar Hagolan assemblage (Garfinkel and Miller 2002:97). It involves a surface luster produced by rubbing with a hard object, usually during the leather-hard stage of drying (Rice 1987:138). WT-40 sherds have red paint, red slip, or cream slip that have been burnished. Occasionally, only the red decorated portion of the vessel is burnished. The WT-40 assemblage contains sherds that have been burnished on the interior, on the exterior, and on both the interior and exterior. This kind of decoration can also appear with horizontal or frame incision.

4.4.4 Wide Painted Lines 11 (4.56 %), 4 below colluvium (2.67 %)

This kind of decoration consists of red lines that are wider than 0.5 cm and appear in horizontal or zigzag/chevron patterns (Garfinkel 1992:55; 1999a:61; Garfinkel and Miller 2002:97). The WT-40 assemblage frequently displays this kind of decoration in combination with framed herring-bone incision. Yet, there is also one occurrence of a wide painted line with a burnished cream slip (Figure B-1).

4.4.5 Thin Painted Lines 5 (2.07 %), 2 below colluvium (1.33 %)

Vessels decorated with red lines that are thinner than 0.5 cm and applied in a horizontal or zigzag/chevron design comprise this decoration category (Garfinkel 1992:55; 1999a:61; Garfinkel and Miller 2002:97). One example of this category from WT-40 is also decorated with cream slip, while the other one has what appears to be a red painted triangular block with thin parallel diagonal lines (Figure B-2).

4.4.6 Herring-Bone Incision 14 (5.81 %), 11 below colluvium (7.33 %)

This kind of decoration consists of an incised row of short slanted parallel lines adjacent to a similar row that slants in the opposite direction. It is framed by incision and appears on the vessel in a horizontal or zigzag/chevron pattern (Garfinkel 1992:55; 1999a:64; Garfinkel and Miller 2002:97). In this form, it has been called the “Sha ‘ar Hagolan decoration” and has been considered representative of a Yarmukian pottery assemblage (Garfinkel 1999a:64; 1992:55; Garfinkel and Miller 2002:97). The WT-40 assemblage often contains this motif in combination with red paint or slip that displays a variety of patterns. Generally, the frame is incised first, it is filled in with herring-bone incision and then the area around the incision is painted, however, examples were found

at WT-40 where paint appears over the herring-bone pattern and inside the incised depression (Figure B-3, 4, 5, 6, 7).

4.4.7 Frame Incision 10 (4.15 %), 6 below colluvium (4.00 %)

Decoration of this kind is characterized by parallel lines incised in a horizontal or zigzag/chevron pattern creating a frame which is not filled by herring-bone incision (Garfinkel 1992:55; 1999a:62; Garfinkel and Miller 2002:100). At WT-40, the frame has been found bare, filled with red paint, or associated with burnished red paint.

4.4.8 Other Incisions 12 (4.98 %), 7 below colluvium (4.67 %)

This category includes horizontal or diagonal lines or dashes incised in a frame, herring-bone incision without a frame, framed square incision, chevrons filled with parallel lines, and single zigzag lines (Garfinkel and Miller 2002:100). The WT-40 assemblage exhibits framed horizontal dashes (Figure A-4. C), unframed herring-bone incision, a small vertical line, and single horizontal incisions with red paint.

4.4.9 Other Decoration (Plastic and Impression) 1 (0.41 %), 1 below colluvium (0.67%)

These kinds of decorations are fairly rare in Yarmukian assemblages. They consist of plastic additions and lunar-shaped impressions (Garfinkel and Miller 2002:100). WT-40 yielded two mendable sherds which fit into this category (Figure 4.5, Figure B-8). They are decorated with an applied cordon which encircles the vessel at the base of the neck.

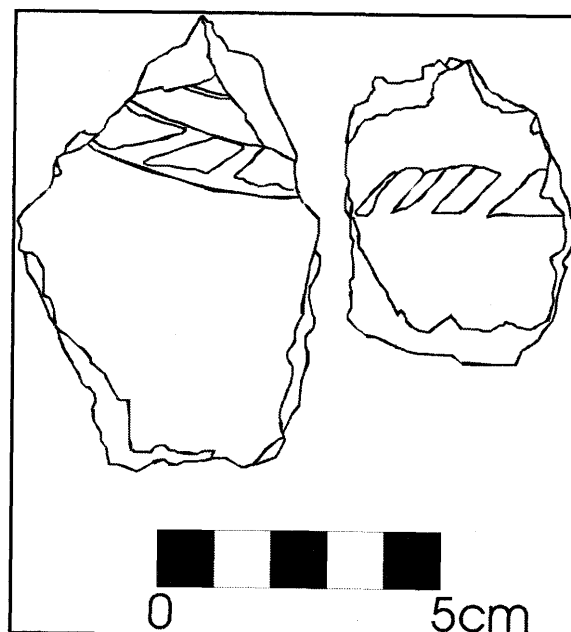


Figure 4.5. Drawings of sherds WT40-A54-62-1 and WT40-A53-50-1 with cordon appliqué.

4.5 Construction

Similar to other LN assemblages, all of the pottery from WT-40 is hand-made. Two primary construction techniques are discernable from the sherds in this assemblage, coiling (22) and slab building (8). A coiled vessel is manufactured by placing clay rolls of uniform thickness around the circumference to gradually heighten the walls (Rice 1987:127; Rye 1981:67). The coils are pinched slightly to overlap forming an oblique juncture which strengthens the bonds between the coils and extends the height of the walls (Rice 1987:127). Once the vessel has reached the desired size and shape the grooved surface is smoothed or scraped further sealing the coils together (Rye 1981:67). Ring building, segmental coiling and spiral coiling exist as variants of this technique (Rice 1987:127). However, it can be very difficult to distinguish between them in archaeological ceramics because the portion of the vessel represented by a sherd would

have to be such that it exhibited specific sections of the coils (Rye 1981:67). Since a sherd can only provide evidence of the use of coils and not the specific technique, that is how the WT-40 pottery is described. Slab construction, on the other hand, is performed by flattening lumps of clay into slabs, then joining the edges of each slab by pressing or smearing (Rye 1981:71; Rice 1987:125). This method of construction is often used to create large vessels, but the morsel-building variant is evidence of this technique executed on a smaller scale (Rice 1987:125). One vessel from WT-40 displays mat impression into the bottom of the disk base, indicating that it was formed on a mat (WT40-A53-29-3).

A variety of secondary forming techniques is also evident in the WT-40 assemblage. Additions to the surface can be divided into functional parts and decoration (Rye 1981:93). The functional applications demonstrated at WT-40 include necks and rims (3), bases (7), and handles (7). One example was found at WT-40 of a vessel with a cordon appliqué decoration at the base of the neck (Figure 4.5). All of the additions were applied in the same manner; the joint surface of a leather hard vessel is roughened, a small amount of slurry is applied to promote adhesion, and the additional part is applied with a small amount of pressure (Rye 1981:93; Rice 1987:148). Upon completion of the vessel form, surface enhancements are added including slips, burnishing, incision, paint, and other surface treatments. Other than the previously mentioned decorative techniques visible on the WT-40 assemblage, the frequent appearance of grass wiping of the vessel interior and/or exterior (26) is also recognizable. Finally, the order of the process of decoration can be discerned by the relationship of paint to incision. Three sherds demonstrate paint over incision but not inside the incised grooves, suggesting that the

incision occurred first, which coincides with Garfinkel's interpretation of the process of creating "Sha 'ar Hagolan decoration" (Garfinkel and Miller 2002:97).

4.6 Temper and Inclusions

A variety of tempers and inclusions are observed in the WT-40 assemblage. Organic temper and/or inclusions occur in over 80 % of the pottery found below the colluvium at WT-40, and are the sole elements of 50.15 % of the vessels represented. Grit is the second most common temper and/or inclusion at 24.46 % (7.74 % solely grit), followed by limestone at 11.15% (2.17 % solely limestone), chaff at 4.64 % (4.33 % solely chaff), and basalt at 3.72 % (0.62 % solely basalt). Grog appears in 3.72 % of the represented vessels, but only as a temper in combination with inclusions in the fabric. Limestone, grit, and grog appear primarily in sherds 0.5-1 cm thick, while basalt occurs in sherds around 1 cm in thickness and chaff from 1-1.5 cm.

4.7 Thickness

The maximum thickness of each sherd from the WT-40 assemblage can be divided into five categories. The first category ranges from 0-0.500 cm which represents 1.67 % of the sherds from below the colluvium (1.25 % of the total sherds), 66.67 % of which are fully oxidized. The second category includes sherds 0.500-1.000 cm thick which consists of 59.89 % of the sherds found below the colluvium (62.56 % of the total sherds), 68.84 % of this category are oxidized. Sherds ranging from 1.000-1.500 cm in thickness comprise the third category, which includes 27.30 % of the sherds below the colluvium (26.37 % of the total sherds), 52.04 % of which are underfired. Only 9.19 % of the sherds below the colluvium (7.33 % of the total sherds) fit into the fourth range of

1.500-2.000 cm thick. Of these, 57.58 % are underfired. Finally, the fifth category includes sherds with a thickness over 2.000 cm, or 1.95 % of the sherds below the colluvium (2.50 % of the total sherds), and 71.43 % of which are underfired.

4.8 Firing

The WT-40 pottery assemblage demonstrates considerable variation in the degree of firing achieved for the vessels. In total, 56.63 % of the sherds are oxidized and 43.37 % are underfired. Below the colluvium 59.33 % are oxidized while 40.67 % are underfired. The thickness of the vessel is also an important factor in relation to firing. As expected, the thinner the sherd the greater the percentage is oxidized, and conversely, the thicker the sherd the greater the percentage is underfired. Fireclouds are apparent on the exterior of 19 sherds and the interior of 8 sherds. These fireclouds are commonly due to the vessel surface contacting the fuel resulting in uneven firing and the deposition of carbon in the surface pores (Rice 1987:155). Overall, the firing technique employed at WT-40 is that of open, non-kiln firing. The producers of this assemblage have a detailed knowledge of firing pottery as evidenced through their ability to fully oxidize pots, the complete lack of fireclouds on decorated vessels, and hence their general capability to control the firing conditions in a non-kiln environment.

4.9 Recycled 8 (1.23 %), 4 below colluvium (1.10 %)

A few pot sherds found at WT-40 appear to have been modified in shape some time after the vessel was broken, and thus recycled for a different function. Three sherds were round, one is triangular, and one is oval. Another oval example was found composed of two mendable sherds which conform to the grasp of the index finger and

thumb at the rounded edge and join together at a manufactured wavy edge. The shape of the edge could only have been created prior to firing. Therefore technically these sherds are not recycled but they are included in this section because of the alternate function they perform from a vessel. Also of interest are two sherds that when mended illustrate a drill hole between them. The drilling process may have actually caused the breakage of the original recycled sherd. All of the recycled sherds from WT-40 are undecorated.

4.10 Conclusion

The LN pottery from WT-40 can be divided into 3 main categories: very fine ware, fine ware, and coarse ware. The very fine ware has a maximum thickness less than 0.500 cm, is oxidized with organic temper and/or inclusions, and tends to be decorated. The fine ware ranges from 0.500 cm to 1.500 cm thick, can be underfired or oxidized with organic, grit, grog, limestone, or basalt temper and/or inclusions, and has a 50 % chance of being decorated. Conversely, the coarse ware is thicker than 1.500 cm, has a tendency to be underfired with organic and grit temper and/or inclusions, is frequently undecorated and principally consists of large vessels.

Small and medium sized vessels constitute 84.38 % of the indicative sherds found below the colluvium at WT-40. The 15.63 % of larger forms present functioned primarily as storage or food processing vessels (Garfinkel and Miller 2002:101). As such, the units excavated appear to have sampled specific activity areas while avoiding others, accounting for the uneven representation of vessel forms at the site. Below the colluvium, 46.44 % of the items from WT-40 are decorated, with 25.08 % of the 81 items decorated not including cream slip. Cream slip constitutes 46.00 % of the decoration employed, the significance of which will be discussed further in Chapter 6. If

cream slip is not counted as a decorative technique then, below the colluvium, 40.74 % are red slipped, 20.99 % are burnished, and 13.58 % have herring-bone incision.

In general, the pottery from WT-40 is hand-made using coiling and slab construction with the application of additional functional parts and decoration. This assemblage displays experienced control of the conditions and variables necessary to accomplish proper firing in an open, non-kiln environment. The few undecorated recycled potsherds demonstrate the reuse of broken vessels at the site and the implication that pottery had secondary functions. The sample of the WT-40 assemblage presented exhibits the diversity and uniqueness required to facilitate a detailed comparison with other LN pottery assemblages from the Levant.

CHAPTER 5

COMPARISON OF WT-40 POTTERY AND OTHER LATE NEOLITHIC SITES

5.1 Introduction

The pottery collected from each excavation unit at WT-40 exhibits a small amount of variation. In order to assert that the similarities between the collections are significant and that the overall sample is unbiased, the pottery from each unit must be statistically tested to determine that it is representative of a single assemblage. Performing an ANOVA test comparing the pottery from each of the three excavated units will determine if the visible artifact variation is greater within the units than among them, validating that the pottery collected from all three units belongs to the same assemblage. Even once the pottery from the three excavated units at WT-40 can be correlated as characterizing one assemblage, its relatively small size warrants justification that it is a sufficient sample representative of the larger assemblage. Sha 'ar Hagolan (Garfinkel and Miller 2002) and Munhata (Garfinkel 1992, 1999a) provide adequate comparative data on diagnostics, bases, decorated sherds, and undecorated body sherds to facilitate a direct comparison for this purpose.

Even once the WT-40 pottery assemblage is established as a normally distributed, unbiased representation of the underlying assemblage, the detailed

typological description developed in the previous chapter does not provide a complete understanding of the assemblage, the site and its relationship to other LN sites. It must also be compared with contemporaneous assemblages in the Levant. In correspondence with Garfinkel's emphasis on decoration styles as characteristic elements for identifying a LN pottery assemblage, statistical analysis is performed to compare the decorative techniques employed at WT-40 with those of Sha 'ar Hagolan. An ANOVA test comparing the decorative techniques at WT-40 with those of Sha 'ar Hagolan will determine if the variation between the two assemblages is great enough to suggest that they represent completely different types of pottery assemblages. Finally, the material culture from WT-40 as a whole is compared with other LN assemblages within the Levant to elucidate its relational context.

5.2 Validity of the WT-40 Assemblage

As previously mentioned, the landscape around WT-40 is littered with a number of archaeological sites, including ones with LN association. Although units A53 and A54 are adjacent to each other, A47 is over ten meters south-east of these units. It is therefore necessary to establish a direct connection between all of the units excavated at the site to validate the collective assemblage and examine the differences that are represented by each unit. An ANOVA test performed on the three prominent decorative techniques found below the colluvium, namely red slip, burnishing, and herring-bone incision, and plain ware for each unit will determine if the variation among the decorations found in each unit is significant. Cream slip is not included in this comparison because it is often found in conjunction with other decorations. Counting a sherd twice for cream slip and red paint decoration would skew the results away from

comparing the sherds collected to comparing the number of decorative techniques or stages employed on them. The null hypothesis is that all three samples of pottery were obtained from the same *assemblage*, WT-40. The actual mathematical work is presented in Appendix C.1 and the results are provided in Table 5.1.

Table 5.1. ANOVA Table for comparing the excavated units at WT-40.

Source of Variation	df	SS	MS	F	p
among	2	93.88	46.94	0.075	4.459
within	8	4996.91	624.61		
total	10	5090.79			

Since F is less than p then the null hypothesis cannot be rejected, implying that all three samples of pottery are from the same assemblage. In this case that represents the assemblage from WT-40.

The pottery assemblage found at WT-40 is thus far relatively small in comparison to LN pottery assemblages from sites such as Sha 'ar Hagolan and Munhata. In order to justify comparing these assemblages to that of WT-40 it must be established that the currently collected material from WT-40 is a representative sample for the site. Since the excavation at WT-40 is limited, the kinds of activity areas represented are affected. The pottery assemblage reflects the activity areas sampled by demonstrating a lack of larger course vessels which would have been used in storage and food processing. A direct comparison between the typological categories represented at each

site would only identify differences between the activity areas sampled at the sites as well as the overall functions of the sites. Since the intent is to establish that the small assemblage from WT-40 is sufficiently representative of a larger assemblage as a whole, regardless of function, the percentages of types present were not compared. Instead, the percentages of diagnostics, bases, decorated sherds (not including cream slip) and undecorated body sherds from the complete WT-40 assemblage as well as below the colluvium, and the Sha 'ar Hagolan and Munhata pottery assemblages are discussed. The percentages are displayed in Table 5.2.

Table 5.2. Percentages of the pottery from WT-40, Sha 'ar Hagolan, and Munhata (Garfinkel and Miller 2002: 88; Garfinkel 1992: 31-32).

SITE	Diagnostics	Bases	Decorated	Undecorated Body Sherds	Total Sherds
WT-40	6.61 %	3.38 %	19.27 %	43.6 %	711
WT-40 Below Colluvium	8.20 %	3.01 %	22.13 %	46.45 %	366
Sha 'ar Hagolan	7 %	3 %	21 %	66 %	34, 232
Munhata	7.2 %	3.7 %	12.8 %	54.9 %	15, 890

Overall, the complete assemblage of WT-40 contains approximately the same percentage of diagnostic items as the Sha 'ar Hagolan and Munhata assemblage. Below the colluvium, the percentage is slightly greater. This is likely due to the intention of this study to increase the diagnostic sample size by removing the over 2 cm rim size limit implemented by Garfinkel at Sha 'ar Hagolan and Munhata through the use of the percentage factor. The percentage of bases found within each assemblage is equal across

all three sites. The percentages of decorated and undecorated sherds appear more complex, yet this is where the limited area of excavation currently executed at WT-40 becomes important. In this case, the fewer activity areas sampled at WT-40 has resulted in a pottery assemblage with less undecorated coarse ware and a greater amount of finer ware. In general, fine wares have an increased probability of being decorated (Garfinkel and Miller 2002:88) which would account for the small increase in decorated items found at WT-40 below the colluvium as well as the decrease in the percentage of undecorated items. Other than the explained difference in percentage of undecorated body sherds, the complete pottery assemblage from WT-40, as well as the assemblage from below the colluvium, are sufficiently representative of the larger assemblages found at Sha 'ar Hagolan and Munhata.

5.3 Comparison

In view of the fact that the small pottery collection from WT-40 is found to be a representative sample of a larger LN assemblage it is appropriate to conduct a more in-depth comparison of the pottery (including the kinds of decoration) and other material culture recovered from the site to those of contemporary sites in the region. In order to preserve the contextual integrity of the comparison, only the pottery assemblage retrieved from below the colluvial debris at WT-40 will be incorporated in the following discussion. In reference to the Yarmukian-Jericho IX debate, this contrast and comparison also includes discussion of material from Jericho IX assemblages in an effort to reveal aspects of the relationship between the two kinds of assemblages, as well as possible flaws or discrepancies which may exist in the typologies currently employed by many researchers.

5.3.1 Contrast of Pottery

The pottery assemblage recovered from WT-40 has many similarities with the Yarmukian typology established for the Sha 'ar Hagolan and Munhata collections. However a degree of variation is still recognizable. For instance, most of the small bowls or cups found at Sha 'ar Hagolan are decorated, whereas half of this category of vessels found at WT-40 are undecorated (Garfinkel and Miller 2002:88). Another distinction can be made between the assemblages in reference to the medium-sized decorated bowls. Bowls with incised decoration occur at such a frequency at Sha 'ar Hagolan that Garfinkel refers to them as "one of the most representative vessels in the Yarmukian assemblage" (Garfinkel and Miller 2002:90). Conversely, the WT-40 pottery assemblage contains no incised bowls. Instead, all examples of decorated bowls at WT-40 exhibit red paint, occasionally accompanied by burnishing, a decoration that is characteristic of Jericho IX pottery assemblages (Garfinkel 1999a:78). A second decorative technique discovered at WT-40 that has parallels with the Jericho Stratum IX collection, but is not found in the Sha 'ar Hagolan or Munhata assemblages, is an example of cordon appliqué. Handleless jars discovered at Jericho, and identified by Garfinkel as Jericho IX ware, exhibit an applied cordon around the base of the neck that resembles the example from WT-40 precisely (Garfinkel 1999a:91).

The analysis of the decorative techniques represented by the WT-40 pottery assemblage performed for this study demonstrates a noticeable difference, the use of cream slip. Garfinkel does not acknowledge this particular kind of surface addition in discussing the Sha 'ar Hagolan assemblage or the Yarmukian typology. Nevertheless, its frequency of occurrence within the WT-40 assemblage requires attention and consideration. Interestingly, Garfinkel does include discussion of cream or "pale" slip

when analyzing the decoration present on vessels from Jericho IX assemblages (Garfinkel 1999a:95-96). The Jericho IX decorative typology is actually characterized by the application of a cream slip in conjunction with reddish painted designs which may be burnished (Garfinkel 1999a:96). In contrast, the lack of mention of cream slips as a decoration at Sha 'ar Hagolan implies that it is not found within Yarmukian pottery assemblages. Yet, the prevalence of cream slipped sherds at WT-40 indicates that more attention should be paid to this kind of decoration in the analysis of other pottery assemblages and perhaps it may be a key in understanding the relationship between Yarmukian and Jericho IX assemblages. Of significance in the comparison of the pottery is the fact that where the WT-40 assemblage varies from the Sha 'ar Hagolan assemblage it does so with respect to elements of Jericho IX ware.

5.3.2 Statistical Comparison of Decoration

As a result of the apparent discrepancies encountered when comparing the decorations found at WT-40 and Sha 'ar Hagolan, with respect to cream slips and burnished painted decoration, and the resulting implication of a Jericho IX typological relationship, a two-sample ANOVA test was performed to determine if the decorative variation is significant (Shennan 1997:88). The difference will be significant if it is greater between the two assemblages than within them. In this instance, the null hypothesis suggests that the two samples are obtained from the same population, thereby sharing a high degree of similarity in distinct stylistic attributes as well as technological and typological attributes. According to Henry's classification system, the two assemblages would then satisfy the criteria for categorization as a *phase/facies* (Henry

1989:83). The statistical manipulation of the numbers can be found in Appendix C.2, and the results are displayed in Table 5.3.

Table 5.3. ANOVA Table for comparing the decorations at Sha 'ar Hagolan and WT-40 below the colluvium.

Source of Variation	df	SS	MS	F	p
among	1	3158617.56	3158617.56	3.21	4.600
within	14	13773258.38	983804.17		
total	15	16931875.94			

Once again, the null hypothesis cannot be rejected because the F ratio is not larger than the critical value. This result suggests that the variation between the decorative techniques at Sha 'ar Hagolan and WT-40 is not significant, and thus the two pottery assemblages belong to the same archaeological *phase/facies*. According to Henry's classification system, this would also imply that the pottery assemblages from WT-40 and Sha 'ar Hagolan are both members of the same socioeconomic culture (Henry 1989:83).

5.3.3 Comparison of Other Material Culture

In order to formulate a more complete interpretation and understanding of WT-40 and its relationship to contemporary sites in the region the material culture, beyond solely pottery, must also be considered. Thus far, the excavation of WT-40 has produced

lithics, ground stone tools, objects, a burial and architecture, all of which can provide preliminary insight when compared with other sites.

The flint industry and ground stone tools from WT-40 demonstrate comparable characteristics comparable to other LN sites (Cropper 2002:94). While a detailed lithic analysis is beyond the scope of this study, a few notable similarities and differences are worth discussion. For instance, Garfinkel identifies two tool types as *fossiles directeurs* of a Yarmukian flint industry: a) small arrowheads, including Haparsa, Nizzanim, and Herzliya points and b) coarsely denticulated sickleblades (Garfinkel 1993:121-122). As previously mentioned, WT-40 has provided Haparsa points from a context below the colluvium, but no sickleblades have been found. Over 50,000 lithics were collected from WT-40 including a few formed tools and retouched flakes illustrating an affinity with most LN sites in the Levant. The typical Yarmukian flint industry exhibits such a wide and unrestricted distribution among all types of LN sites that its utilization is imprecise as a classificatory identifier (Garfinkel 1993:123). A sling stone and a fragment of a pestle represent the ground stone tool assemblage from WT-40 below the colluvium. Such a small sample makes comparison difficult beyond the recognition that similar items have been found at other Yarmukian sites (Garfinkel 1993:123).

The limited number of objects and burials discovered at WT-40 are representative and yet unique in comparison to the recovered material from other LN sites. A burnished clay rod with a slightly pointed end was found at WT-40, and is similar to items found at Munhata (Garfinkel 1993:121), Abu Thawwab (Kafafi 1993:103), and Sha 'ar Hagolan (Garfinkel 1999b:28-29). Occasionally these objects are also referred to as clay pestles, cultic symbols or phallic symbols, but in this instance the term "clay rod" is preferred because it is descriptive without assigning an assumed

function. WT-40 also produced a fragment of a limestone bracelet resembling those recovered from LN contexts at 'Ain Ghazal (Rollefson 1993:97) and from Yiftah'el (Braun 1997:186). The discovery of a wooden comb at WT-40 has no recognizable parallels from the LN. However, elaborately carved bone combs do appear in later periods. The burial found at WT-40 illustrates similarities with the other burials associated with Yarmukian pottery. It was located beneath a mud floor in a north to south orientation similar to those found at Wadi Shu'eib and although no grave goods were associated with it the remains of burnt animal bones also parallel the Wadi Shu'eib burial (Kafafi 1993:112). Its primary burial context with the skull intact resembles the examples from Sha 'ar Hagolan, Habashan Street, and Munhata, and its flexed position is analogous to all of the burials mentioned above (Garfinkel 1993:127; Kafafi 1993:112).

The architecture exposed at WT-40 has yet to be fully analyzed. The excavated portions of A47 reveal what appears to be a round structure with a radius of approximately 2 m, though it may also represent the curved section of an apsidal or oval structure. Rounded structures have been reported from Munhata, Megiddo, Abu Thawwab, and Jericho (Garfinkel 1993:28; Kafafi 1993:108 Garfinkel and Miller 2002:73), while apsidal architecture has been recognized at 'Ain Ghazal and Abu Thawwab (Kafafi 1993:108). On the other hand, A53 and A54 revealed two curved walls that join together at the arc, approximately at a 90 degree angle. This type of construction may be the result of separate building phases which formed adjacent rooms, or it may be a structure composed of two adjacent rounded rooms. Although a two rounded room structure is rare, this type of architecture has also been found at Jericho (Garfinkel 2002:73; from Kenyon 1981:Fig 227c). Remains of rectangular structures are

also visible on the surface of WT-40, which is similar to sites like Abu Thawwab, Wadi Shu'eib and 'Ain Ghazal in Jordan (Kafafi 1993:108), and Sha 'ar Hagolan and Megiddo in Israel (Garfinkel 1993:128). The massive stone construction employed at WT-40 contrasts greatly with the "squatter occupation" identified at Yiftah'el (Braun 1997:207), and related more closely to the conscious organization, manipulation and construction of space found at Sha 'ar Hagolan (Garfinkel and Miller 2002:71).

5.4 Conclusion

The contemporaneity of units A53 and A54 is unquestionable, but the distance to unit A47 combined with visible variations in its ceramic collection required justification of the continuity of the occupation across all three excavation units. An ANOVA test performed on the pottery from these units confirms that it all belongs to the same *assemblage*. A direct comparison of the percentages from WT-40 with the diagnostics, bases and decorated sherds of the Sha 'ar Hagolan assemblage validated the representative nature of the sample from WT-40, despite its relatively small size.

Since it has been determined that the pottery assemblage from WT-40 is a representative sample size, a comparison of the pottery, its decoration and associated material culture is essential in understanding the context of the site. The pottery assemblage from WT-40 suits the Yarmukian typology with respect to vessel type, technology and herring-bone incised decoration. Yet the differing elements in decorations, such as the use of cream slip, correspond, instead, with that of the Jericho IX pottery typology. Given that these variations are related to decoration, an ANOVA test comparing decorative techniques at WT-40 and Sha 'ar Hagolan was implemented, verifying the association of both pottery assemblages with the same *phase/facies*.

In comparing the lithics, stone tools, objects, burial and architecture found at WT-40 with those of other LN sites in the region it is obvious that parallels exist. Nevertheless, the variation within each of these categories across sites is extensive. This variation makes establishing classic typological characteristics from these aspects of material culture increasingly difficult. The attributes become merely indicators of a LN association rather than a specific typological one.

The excavated material from WT-40 clearly represents a LN assemblage, as previously determined in Dawn Cropper's Master's thesis. Analysis of the pottery assemblage indicates a direct relationship to the Yarmukian pottery typology developed by Garfinkel. Comparing the decorative techniques at WT-40 with those recorded for Sha 'ar Hagolan demonstrates that both assemblages belong to the same *phase/facies*. Accordingly, the little variation that exists between the two assemblages requires some investigation, especially since these variations actually reflect some similarities with the Jericho IX typological assemblages. Furthermore, the pottery assemblage from WT-40 also suggests that a reassessment of the two typologies is essential.

CHAPTER 6

SUMMARY AND CONCLUSIONS

6.1 Summary

The salvage excavation of WT-40 in 2004 confirmed its LN association. The site formation processes have left the site capped by a layer of colluvial debris providing pristine conservation of the original habitational context. Thus, the pottery retrieved from below the colluvium has been given principal consideration in this study. The pottery from all three excavation units has been determined to belong to a single assemblage. A direct comparison of the percentages of diagnostics, bases, and decorated sherds found in this assemblage with that of Sha 'ar Hagolan indicates that the 366 sherds from WT-40 do comprise a representative sample, if one bears in mind the lack of larger coarse ware vessels from WT-40.

Below the colluvium, WT-40 produced 68 indicative sherds which identified approximately 6 small open vessels, 5 small closed vessels, 6 medium-sized open vessels, 8 medium-sized closed vessels, 3 large open vessels, and 1 large closed vessel. This assemblage also includes 11 vertical loop handles and 11 bases, comprised of 7 flat bases, 2 disc bases, and 2 ring bases. The pottery from WT-40 also exhibits a similar phenomenon to that observed at Sha 'ar Hagolan, the presence of recycled sherds (Garfinkel and Miller 2002:100-101). Both sites illustrate the use of broken potsherds for secondary functions, and possibly a second use for fired clay sherds. The

vessels represented by typologically diagnostic sherds indicate that the assemblage from WT-40 corresponds with the typological framework developed by Garfinkel for Sha 'ar Hagolan to identify Yarmukian pottery assemblages (Garfinkel 1992:32-55; Garfinkel 1999a:19-59; Garfinkel and Miller 2002:88-95).

The WT-40 pottery assemblage from below the colluvium also includes 169 decorated sherds representative of the 8 kinds of decoration identified at Sha 'ar Hagolan (Garfinkel and Miller 2002:97-100). The decorated sherds from this assemblage consist of 40.74 % with red slip, 20.99 % with burnishing, 4.94 % with wide painted lines, 2.47 % with thin painted lines, 13.58 % with herring- bone incision, 7.41 % with frame incision, 8.64 % with other incision, and 1.23 % with other plastic decoration. An ANOVA test comparing the decorated sherds from WT-40 and Sha 'ar Hagolan determined that the degree of variation between the stylistic attributes of the two assemblages is not significant enough to conclude that they characterize different *phases/facies*.

The additional qualities analyzed in the study of the WT-40 pottery supplement Garfinkel's stylistic typology with information concerning construction techniques. The examination of these traits determined that the main construction methods employed at WT-40 involve coiling and slab building. The primary temper and inclusions observed include organics, grit, limestone, chaff, and basalt, similar to those recognized at Sha 'ar Hagolan (Garfinkel and Miller 2002:87). The maximum thicknesses of each sherd from below the colluvium at WT-40 can be divided into five categories: 0-0.500 cm, 0.500-1.000 cm, 1.000-1.500 cm, 1.500-2.000 cm, and over 2.000 cm. Each of these categories corresponds to a specific proportion of the overall 59.33 % oxidized and 40.67 %

underfired sherds found at WT-40. These were fired in an open, non- kiln process. A summary of the thickness and degree of firing results can be found in Table 6.1.

Table 6.1. Degree of firing percentages in relation to maximum thickness categories.

Maximum Thickness (cm)	Percent of Assemblage Below Colluvium	Percent Oxidized	Percent Underfired
0-0.500	1.67	66.67	33.33
0.500-1.000	59.89	68.84	31.16
1.000-1.500	27.30	47.96	52.04
1.500-2.000	9.19	42.42	57.58
over 2.000	1.95	28.57	71.43

In general, three main wares are identifiable based on the manufacturing process, very fine ware, fine ware and coarse ware. The very fine wares tend to be less than 0.500 cm thick, are oxidized with organic inclusions and frequently appear with decoration. The fine wares range from 0.500 cm to 1.500 cm thick, contain organic, grit, grog, limestone, or basalt inclusions, can be oxidized or underfired, and may or may not be decorated. Finally, the coarse wares are thicker than 1.500 cm, tend to be underfired with organic and grit inclusions, and are primarily undecorated. Although only two kinds of wares are identified at Sha 'ar Hagolan, sherd thickness was not included in the formation of the categories which can explain the lack of recognition of the very fine ware (Garfinkel and Miller 2002:88). Overall, the technology implemented in the manufacture of the WT-40

pottery is equivalent to that employed at Sha 'ar Hagolan. Therefore, the typological, stylistic, and technological attributes of the WT-40 pottery assemblage are sufficiently similar to those of the Sha 'ar Hagolan pottery assemblage to be classified as from the same *phase/facies*, and thus corresponding socioeconomic culture.

6.2 Reassessing the Pottery Typologies

The pottery assemblage from WT-40 raises the question of the relationship of Jericho IX Ware to Yarmukian Ware. Admittedly, Jericho IX Ware is similar to Yarmukian Ware. Consequently, Garfinkel employs the same typological framework for both kinds of pottery assemblages (Garfinkel 1999a:75). The distinction between Yarmukian and Jericho IX pottery is emphasized through the addition of two types to the typological classification of Jericho IX Ware, shallow bowls (C6) and hemispherical bowls (C7) (Garfinkel 1999a:75). However, similar vessels are identified from so-called Yarmukian assemblages at Munhata, 'Ain Ghazal, Abu Thawwab, Sha 'ar Hagolan, and Megiddo (Garfinkel 1999a:33-34). In fact, type C5 of the typology, consisting of various bowls, is divided into two clear categories, shallow bowls and hemispherical bowls (Garfinkel 1999a:32-34). The assertion is made that these types of vessels rarely appear within a Yarmukian context, but are frequently reported from Jericho IX contexts. Unfortunately, no numerical or statistical data is available concerning the frequencies of the types of vessels from any of the recognized Jericho IX assemblages (Garfinkel 1999a:75). As a result, the precise frequency of appearance of type C6 and C7 vessels within Jericho IX assemblages is unknown.

A number of other discrepancies are recognized when directly comparing the types identified in Jericho IX assemblages with those of Yarmukian assemblages. For

instance, in type C1, deep decorated bowls, the only difference acknowledged is the frequency with which herring-bone incision appears on these vessels, claiming its rarity within Jericho IX assemblages (Garfinkel 1999a:78). Surprisingly, the majority of the examples of herring-bone incised C1 vessels from Jericho IX assemblages are found at Jericho, the so-called “type site” for the typology (Garfinkel 1999a:77). Also, type D1 (Sha ‘ar Hagolan jars) is not acknowledged within the Jericho IX typology, regardless of the appearance of this type of vessel in the assemblage (Garfinkel 1992:43). Instead, herring-bone incised pattern is added as a decoration found on type D2 vessels, Jericho IX jars (Garfinkel 1999a:87). Although it is argued that the incised D2 jars do not have the high necks of Sha ‘ar Hagolan jars, a comparison of Figure 6.1 and 6.2 counters that claim (Garfinkel 1999a:87).

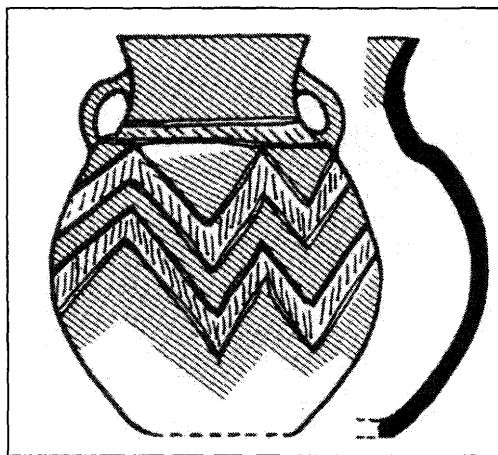


Figure 6.1. Type D1 jar from Sha ‘ar Hagolan (Garfinkel and Miller 2002:122).

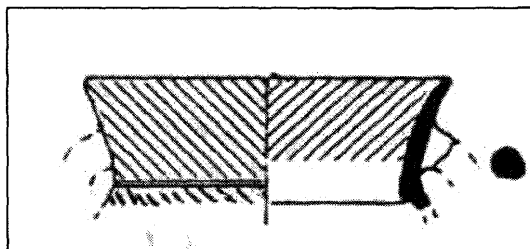


Figure 6.2. Type D2 jar with incision from Jericho Stratum IX (Garfinkel 1999a:89).

Furthermore, type D3, consisting of various medium- sized jars, designates vessels that are low necked Sha 'ar Hagolan jars or decorated Jericho IX jars (Garfinkel and Miller 2002:93). Perhaps some of the vessels identified as Jericho IX jars (D2) in Garfinkel's description of the Jericho IX typology (1999a:87), should actually be assigned to type D1 and/ or D3.

In comparing the larger vessels, type E2, the deep large bowl is not recognized within Jericho IX assemblages either, but it is also considered very rare at Sha 'ar Hagolan (Garfinkel and Miller 2002:91). No large Sha 'ar Hagolan jars (F2) are identified from Jericho IX assemblages, but the example provided from Sha 'ar Hagolan does not have a diameter over 20 cm and should have been included with the medium-sized vessel category, weakening the contention for the existence of type F2 (Garfinkel and Miller 2002:120). Another distinction identified is the presence of jars with handles on their bodies in Jericho IX assemblages and an absence of such vessels in Yarmukian assemblages (Garfinkel 1999a:87). However, the recognition of this type of characteristic within an assemblage requires either complete vessels or very specific portions of vessels for identifying the presence of a handle and its exact location in relation to the form of the vessel.

With respect to the typological attributes of Jericho IX and Yarmukian assemblages, the main differences relate to decorative techniques (Garfinkel 1999a:96). The characteristic decoration affiliated with Jericho IX assemblages consists of a cream slip applied to the entire vessel's surface with red to brown burnished painted patterns over the slip (Obeidat 1995:106; Garfinkel 1999a:96). On the other hand, Yarmukian assemblages are characterized by framed herring-bone incision accompanied by red painted patterns not over the incision (Obeidat 1995:106; Garfinkel and Miller 2002:97).

Nevertheless, painted and burnished pottery is also found within the Sha 'ar Hagolan assemblage, the Yarmukian "type site", and framed herring- bone incised pottery is represented in the Jericho assemblages, the Jericho IX "type site" (Garfinkel 1999a:96). The exact proportions in which these decorations are found can not be directly compared as a result of the lack of compiled numerical data on Jericho IX assemblages. Yet the appearance of labelled *fossiles directeurs* at the different "type sites" is definitely indicative of flaws in the classificatory system and typological consistency (Whittaker, et al. 1998), which results in the misunderstanding of the relationship between these two kinds of assemblages.

6.3 Implications for the Yarmukian- Jericho IX Relationship

The high degree of similarity between Yarmukian assemblages and Jericho IX assemblages, as defined by the "type sites", demands a more detailed examination of the socioeconomic and sociocultural relationship which may have existed between the groups utilizing these pottery types. Unfortunately, reliable radiocarbon dates have only been retrieved from sites associated with Yarmukian assemblages, thereby inhibiting solid judgement on the chronological relationship between the two types of assemblages (Obeidat 1995:106; Garfinkel 1999c:10). Previously, the geographical distribution of these types of assemblages had been defined, with Yarmukian assemblages confined to the north and Jericho IX assemblages to the south (Garfinkel 1993:130), but the southern location of WT-40 is evidence of regional overlap of these assemblages as well. It has also been suggested that these assemblages existed simultaneously, but autonomously (Obeidat 1995:106; Garfinkel 1993:130). However, given the proximity of WT-40 to sites with Jericho IX assemblages, combined with the large number of common

characteristics apparent within the types of pottery assemblages, complete autonomy becomes questionable. Archaeological interpretation should not ignore the elements of human interaction and human agency, especially in instances of direct attribute similarity. According to Blackham's unitary association method, greater similarity suggests inter-site connectedness and overall regional interaction, a circumstance he determines is the case in the LN (Banning 2002:154).

At the site level, it may be possible to discern relationships which could then be tested on a regional level to acquire an overall impression of the LN in the southern Levant. Yet even at the level of site analysis problems are encountered. One such problem is the identification of find spots and small scale sites as corresponding to a Yarmukian or Jericho IX assemblage on the basis of surface finds or diminutive pottery collections which have not been proven to be a representative sample of either assemblage (Lovell 2001:6). It has already been pointed out that both kinds of "characteristic" pottery decoration can be found within the assemblage of a single site. Thus a framed herring- bone incised sherd, or conversely cream slipped and burnished painted sherd does not unequivocally identify a Yarmukian or Jericho IX assemblage. The lack and incomplete nature of publications of LN collections, other than the type sites, also continue to hamper attempts to detect correlations between these types of assemblages.

Furthermore, the situation is exacerbated by the fact that the sites that are presented in a textbook format have greater influence over the archaeological terminology and chronology used and accepted than the smaller sites that have been excavated less and are published in articles scattered throughout journals in a variety of languages (Gitin 1985:103-104). An unfortunate result of this bias is that the smaller LN

sites in the southern Levant that are sporadically published tend to be ignored. Instead, the large sites, like Sha 'ar Hagolan, have become emphasized by basing the typologies on their assemblages. In the case of the early LN, the plethora of small sites implies that they may actually be the norm, representing the majority of the habitations during this period, whereas the larger sites represent specific scenarios of sites with a greater communal function, atypical of the period. Basing a typology on an anomaly would skew the resulting information, and may explain why it is so difficult to discover another assemblage which corresponds solely to that typology.

Although the LN pottery assemblage from Jericho displays both kinds of identifying decorative techniques, "solely" Jericho IX assemblages do exist in the archaeological record as well. The pottery assemblages from Dhra' and Khirbet ad-Dharih contain only painted decorations (Obeidat 1995:106). In fact, the most recent excavation of Dhra' has produced only one possibly dash incised sherd, clearly allowing the identification of the assemblage as classic Jericho IX, based on the emphasized defining decorative characteristic outlined by the typology (MacKay 2006: personal communication). Interestingly, the painted decorations on the pottery at Dhra' coincide with those found at WT-40, both in colours and patterns. As well, the fabrics of the painted sherds at both sites are extremely similar. Since it has been established that the pottery from Dhra' was manufactured locally from nearby clay sources, the possibility arises that some of the pottery from WT-40 may have arrived there through a trade network established during the LN. However, petrographic analysis and comparison of the results from the two assemblages is required to determine such circumstances for certain.

The Pre- Stratum II deposits of Yiftah'el may further aid in the understanding of the relationship between Yarmukian and Jericho IX pottery assemblages. First, the pottery collection has been labelled as having the closest similarities to Jericho IX assemblages and yet the site is located in the northern region of the Mediterranean climate zone (Braun 1997:124). Second, the assemblage includes both pottery and *vaisselles blanches* (White Ware) within the same context and sharing the same sophisticated morphology (Braun 1997:123). The White Ware vessels associated with PPNB and PPNC sites such as 'Ain Ghazal do not demonstrate the advanced delicate technology visible in the Yiftah'el collection (Braun 1997:123). Only through the implementation of petrographic analysis could the White Ware be distinguished from the pottery at Yiftah'el (Braun 1997:123). The pottery from this site displays decoration similar to Jericho IX as well as finer constructed White Ware vessels, which may represent the intermediate period previously unrecognizable between the PPN and the PN. Unfortunately, even more confusion is met when attempting to understand Yiftah'el because the coarse ware is reported as representative of Yarmukian pottery assemblages (Braun 1997:124). Surprisingly, no justification is provided for the interpretation. This serves as another example of the offhand use of terminology that is encountered in studies of the early LN of the southern Levant which inhibits the development of a more complete understanding of the socioeconomic and sociocultural circumstances of the time period.

The exact relationship between Yarmukian and Jericho IX pottery assemblages still remains to be determined. Ultimately, some degree of interaction appears to have taken place, as evidenced by the overlap in geographical locations, stylistic characteristics, typological attributes and technology. The degree of similarity between

Yarmukian and Jericho IX pottery technologies and typologies implies a relationship on the level of an *industry*, which suggests that collectively they may represent a socioeconomic culture group. This culture group is comprised of phases/facies based on subcultures of an expanding cultural tradition (Clarke 1968:289). An example of one of these archaeological phases/facies is the one identified for the pottery assemblages from Sha 'ar Hagolan. Conversely, pottery assemblages which are characteristically Jericho IX in decoration, from sites such as Dhra' and Khirbet ad- Dharih, demonstrate a related archaeological phase/facies, or socioeconomic subculture, which belongs to the same cultural group. The transitional zone of interaction, roughly around the center of the southern Levant, provided an opportunity for the combination or exchange of ideas which has resulted in sites with assemblages that constitute a regional subculture within the overarching Pottery Neolithic cultural tradition, perhaps similar to the assemblage from Jericho Stratum IX. Unfortunately, without a clear chronology of the occupations from this time period the exact direction and progression of this system can only be speculative.

The pottery assemblage from WT-40 has an interesting position within the Yarmukian- Jericho IX debate. The similarity in typology and technology immediately determines that WT-40 is of the same industry as Yarmukian and Jericho IX pottery. The degree of stylistic similarity between the WT-40 and Sha 'ar Hagolan assemblages suggests that they belong to the same archaeological phase/facies. However, statistical comparison with the Jericho Stratum IX assemblage has the potential to arrive at the same conclusion. Nevertheless, though the painted ware from WT-40 is directly relatable to the decorated ware from Dhra', the complete lack of incised pottery within the Dhra' assemblage obviously distinguishes it from the WT-40 assemblage. Therefore,

overall, WT-40 appears to have the characteristics, as well as central location, of an assemblage from the transitional interaction zone. Since style is not static in the production of pottery and choice, including change, is not random, interaction within this region during the LN could very likely have led to assemblages like WT-40 as a blending of characteristics (Dietler and Herbich 1998:253). The other possibility within an inter-connected region of interaction is the occurrence of trade, which would also create a mixed site assemblage. Further excavation of WT-40 will aid in determining the function of the site, providing more precise input into the processes involved in the acquisition and choices which created the pottery assemblage at WT-40. Currently, the WT-40 assemblage appears to belong to a regional subculture within the same cultural group as the typically defined Yarmukian and Jericho IX typologies.

6.4 Conclusion

The period spanning from the end of the PPNB to the beginning of the Early Bronze Age in the southern Levant has engaged scholars in debate over chronological and cultural confusion for decades (Banning 2002:150). The discovery, excavation, and analysis of WT-40 offer new input into the argument. The typological analysis and stylistic comparison of the pottery assemblage from WT-40 with that of Sha 'ar Hagolan allow for the comparison of the similarity and differences between the two assemblages. Presently, the findings suggest that the pottery assemblage from WT-40 belongs to the same phase/facies as the Sha 'ar Hagolan assemblage, but future excavations have the potential to reveal different findings, particularly in light of the site's location within the transitional interaction zone.

Numerous suggestions can be made for the direction of future research. First, attention must be paid to the terminology employed. A standard terminology should be developed to encourage and assist in the comparison of assemblages. Furthermore, the addition of technique and technological attributes to the analytical process of this study will, it is hoped, become common practice in pottery analysis, thus facilitating the creation of comparative data for future studies. Also, it is recommended not to focus primarily on "type sites" and *fossiles directeurs* in an attempt to discover the 'best fit' circumstances. Instead the goal should be to acknowledge what is actually present in an assemblage through description and careful interpretation, followed by comparative procedures to situate and integrate the assemblage within a broader regional context. It is recognized that "the 'type-site' deserves a perhaps respectful but necessary death" in order to develop an understanding of a general pattern of human settlement and behaviour in a given region within a specific time period (Rollefson 1996:220). Finally, attempts at understanding the actual progression and interactive behaviours involved in the production of pottery during this period are required to obtain a more complete chronological and developmental summary of the situation in the LN of the southern Levant.

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APPENDIX A

WT-40 POTTERY ASSEMBLAGE

(Table A-1 to A-3 are organized to facilitate comparison with the Sha 'ar Hagolan data.)

Table A-1. The number of items per type represented by the WT-40 pottery assemblage in total and below the colluvium.

	Total Items	Total Below Colluvium
A1	9	6
A4	1	0
B1	3	2
B2	4	2
B3	1	1
C1	6	4
C2	6	2
C3	1	0
D1	5	5
D2	5	3
E2	1	1
E4	2	2
F1	2	1
F3	1	0

Table A-2. Diagnostic and decoration summary of the total sherds from WT-40.

Sherds	Indicative	Rims	Bases	Handles	Decorated
650	115	52	24	20	292
100%	17.69%	8.00%	3.69%	3.08%	44.92%

Table A-3. Diagnostic and decoration summary of the sherds from below the colluvium at WT-40.

Sherds	Indicative	Rims	Bases	Handles	Decorated
366	68	32	11	11	169
100%	18.58%	8.74%	3.01%	3.01%	46.17%

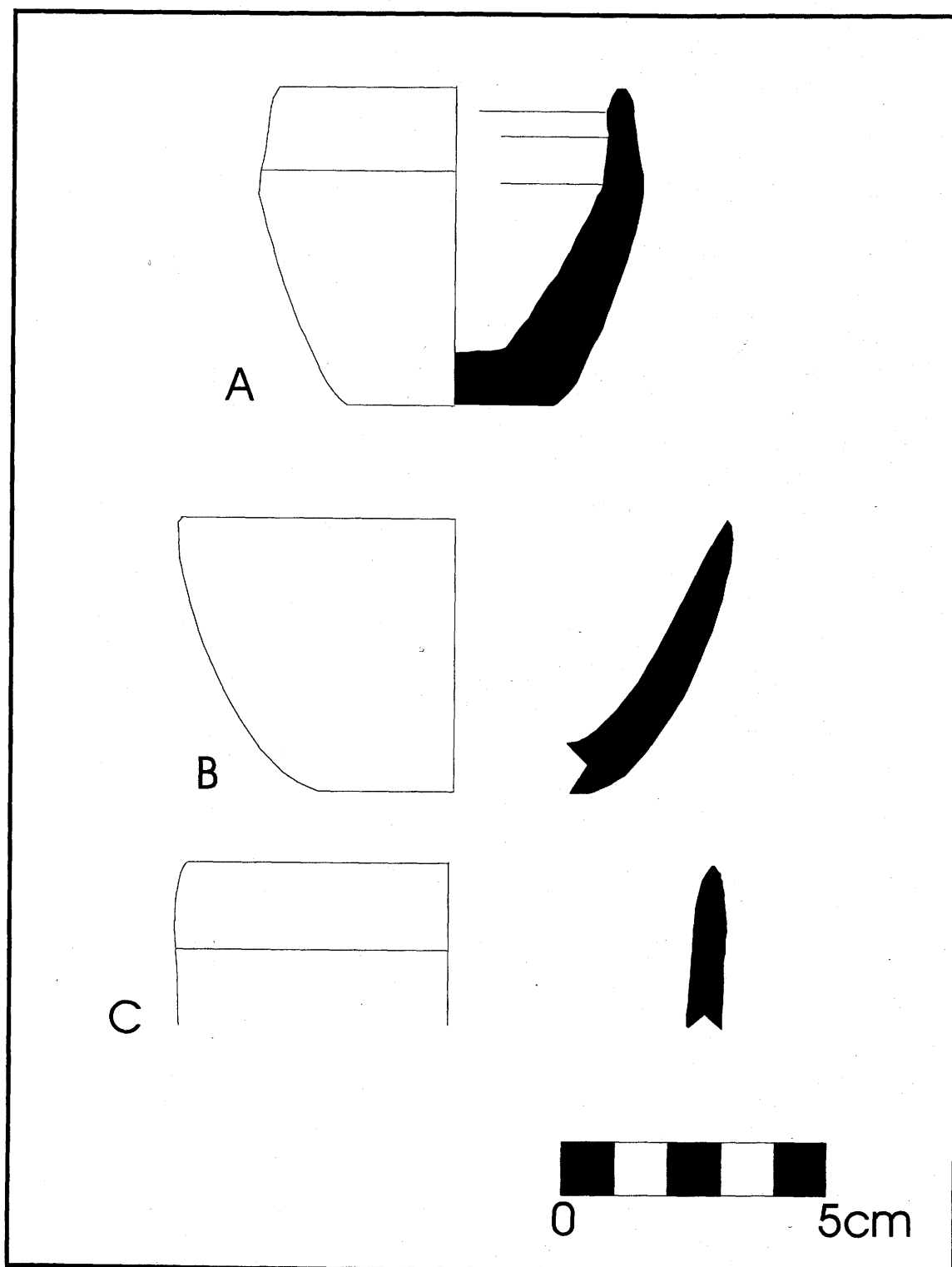


Figure A-1. Drawings of Type A1 vessels from WT-40. A. WT40-A54-52-2, B. WT40-A53-13-1, and C. WT40-A47-28-3.

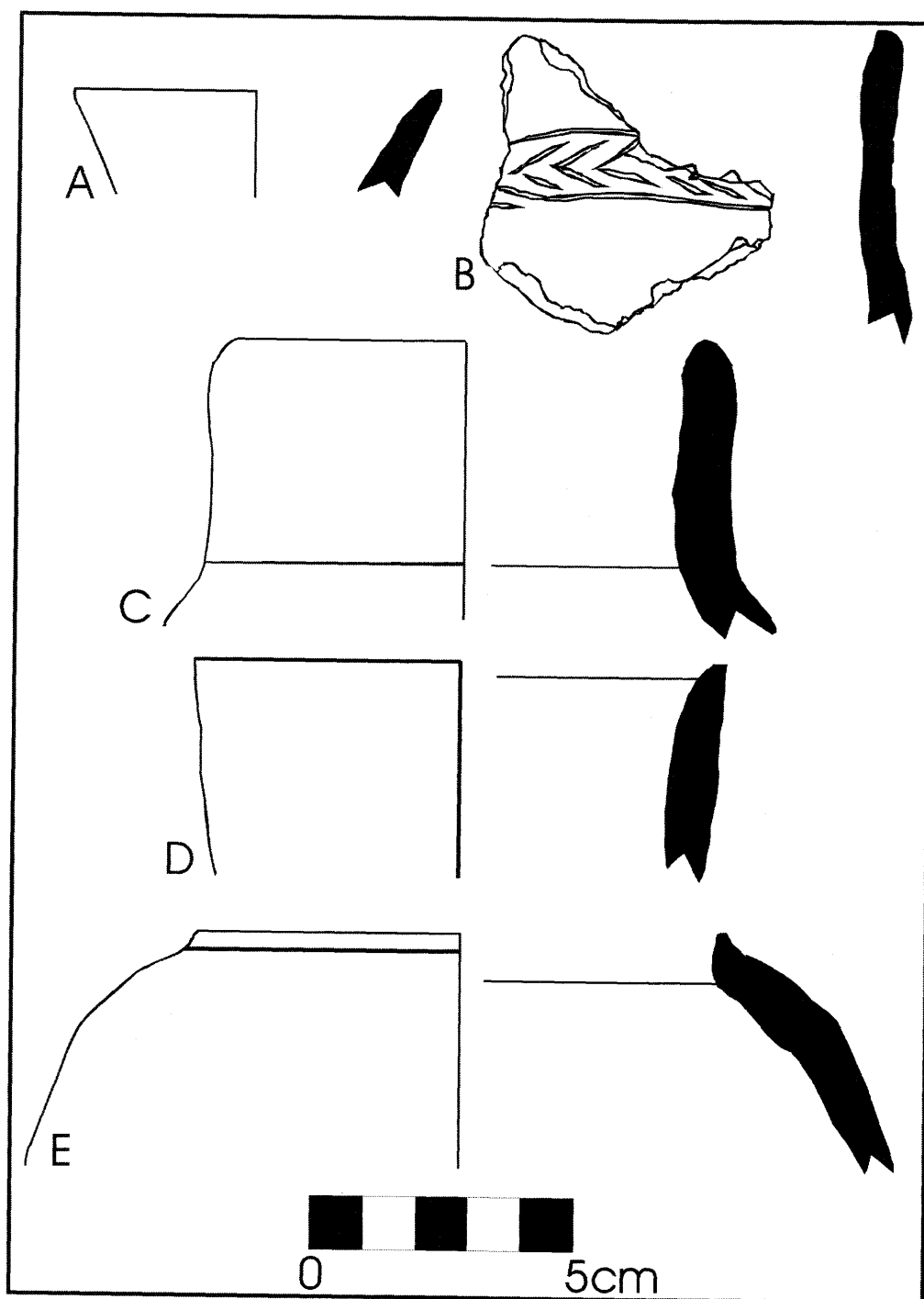


Figure A-2. Drawings of Class B vessels from WT-40. A. Type B1 vessel WT40-A53-13-3, B., C., and D. Type B2 vessels WT40-A47-61-2, WT40-A53-11-1 and WT40-A53-50-2, E. Type B3(b) vessel WT40-A53-15-1.

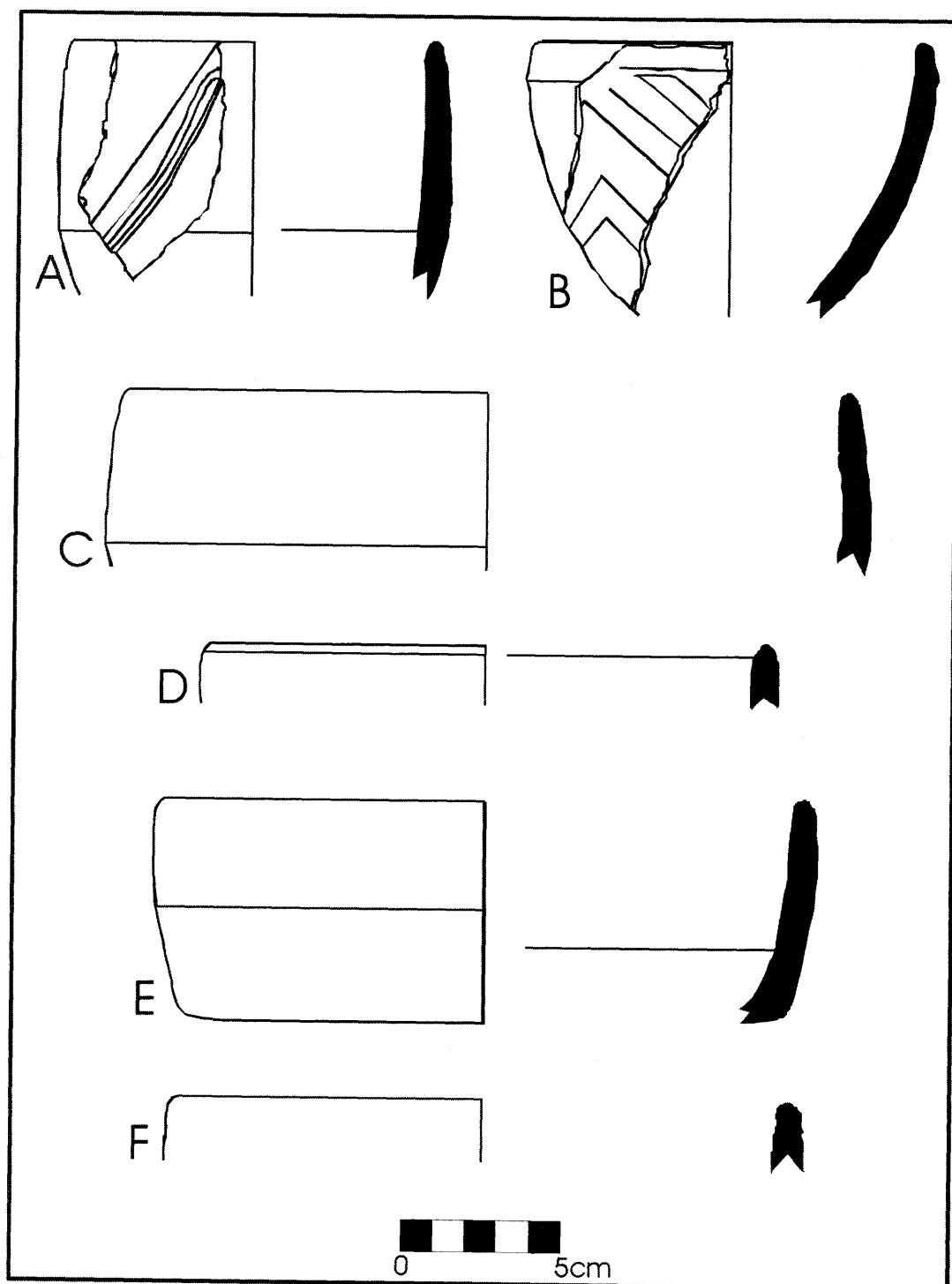


Figure A-3. Drawings of Class C vessels from WT-40. A. to D. Type C1 vessels WT40-A47-27-5, WT40-A54-44-2, WT40-A47-53-2, WT40-A47-37-1. E. and F. Type C2 vessels WT40-A47-25-1 and WT40-A54-27-4.

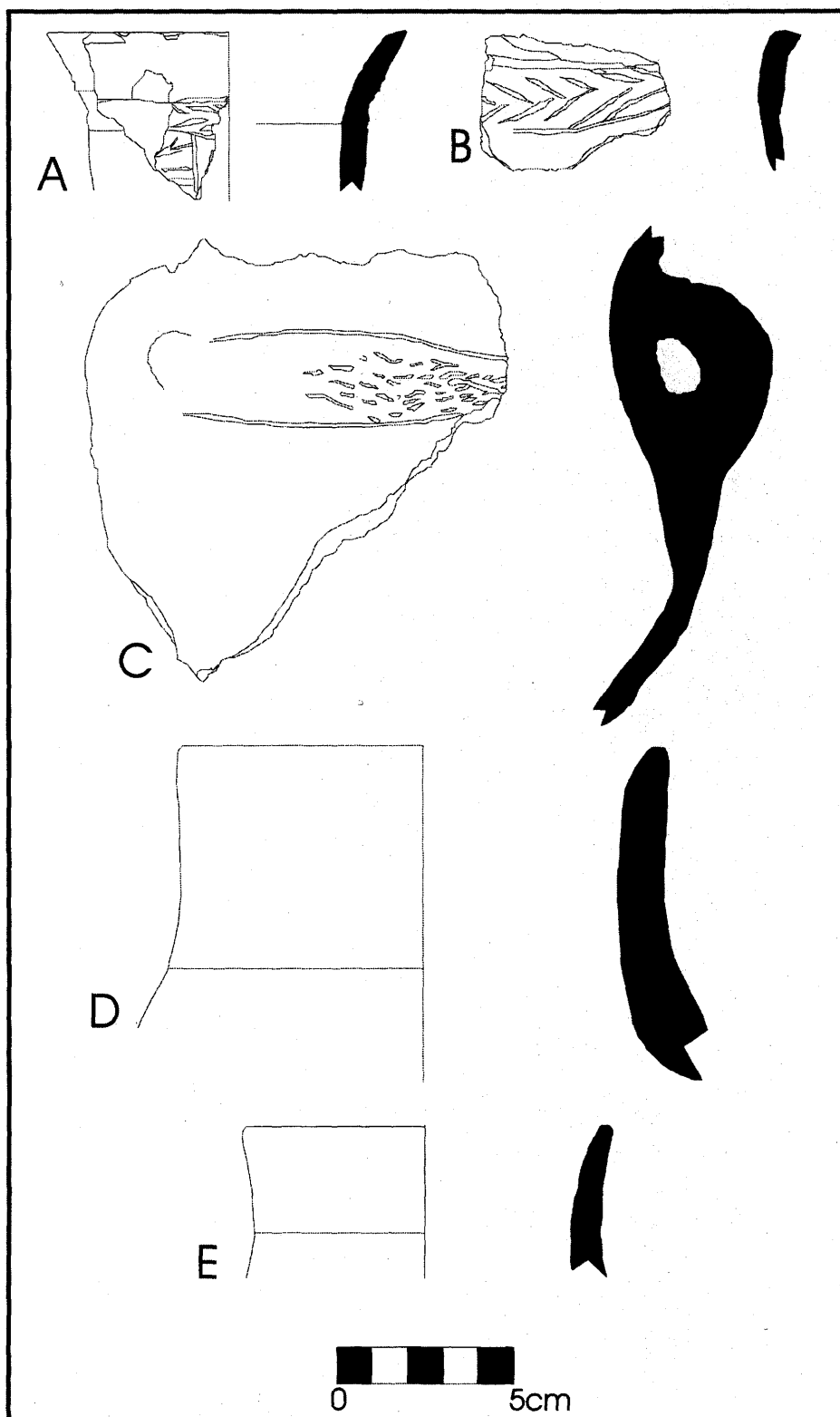


Figure A-4. Drawings of Class D vessels from WT-40. A., B., and C. Type D1 vessels WT40-A47-52-1, WT40-A47-55-1, and WT40-A53-13-2. D. and E. Type D2 vessels WT40-A53-25-1 and WT40-A53-53-1.

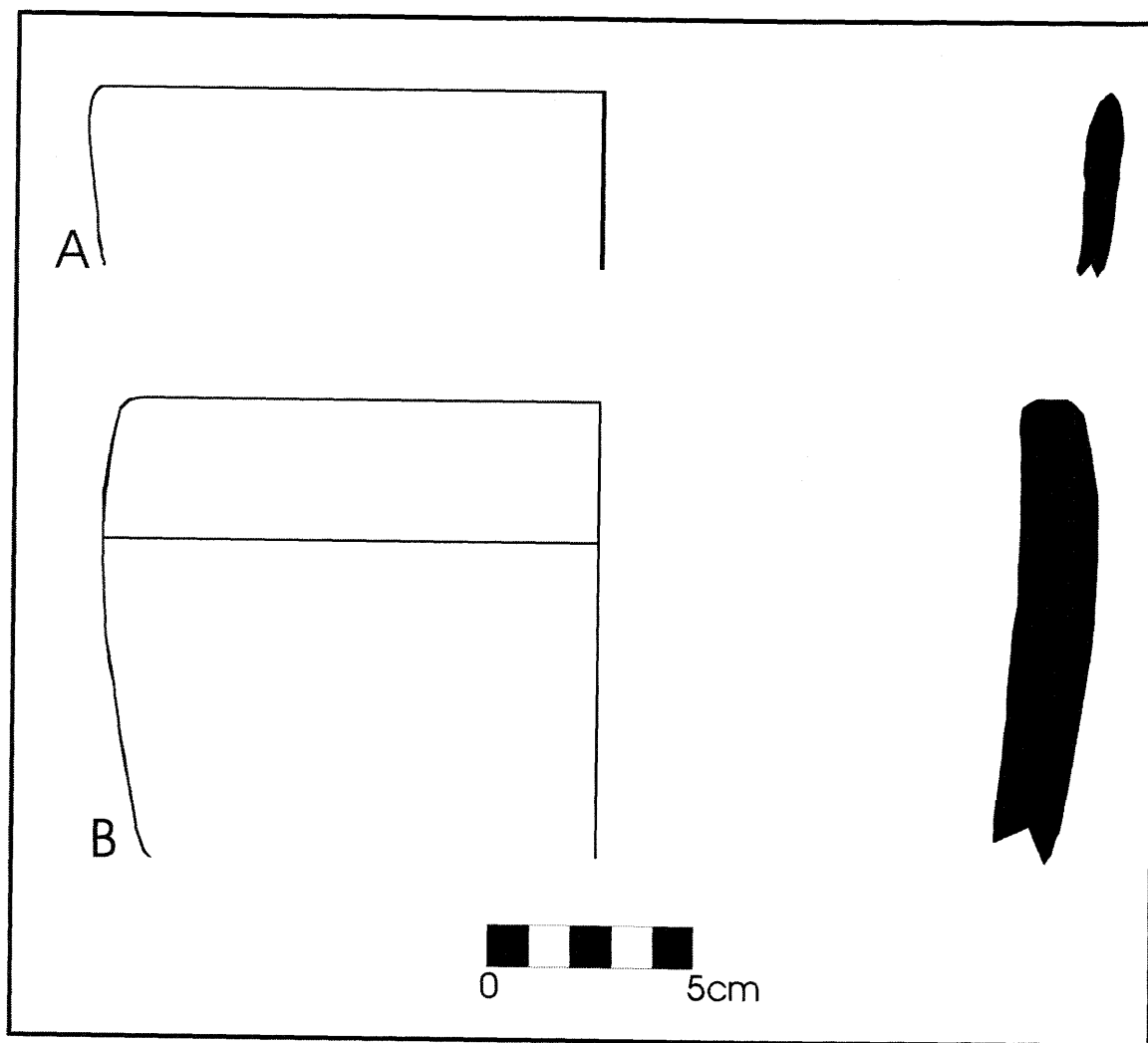


Figure A-5. Drawings of Class E vessels from WT-40. A. Type E2 vessel WT40-A47-44-1. B. Type E4(b) vessel WT40-A47-38-2.

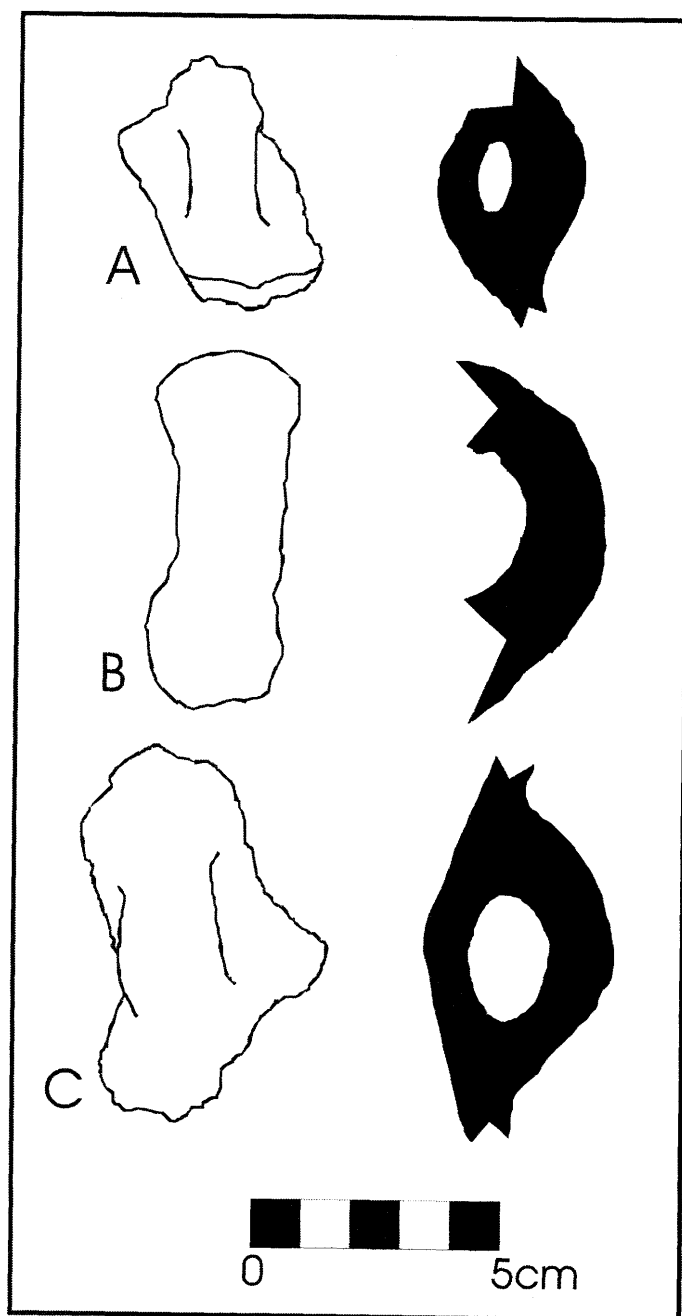


Figure A-6. Drawings of loop handles from WT-40.
A. WT40-A53-20-2, B. WT40-A53-29-1, and C. WT40-A53-13-5.

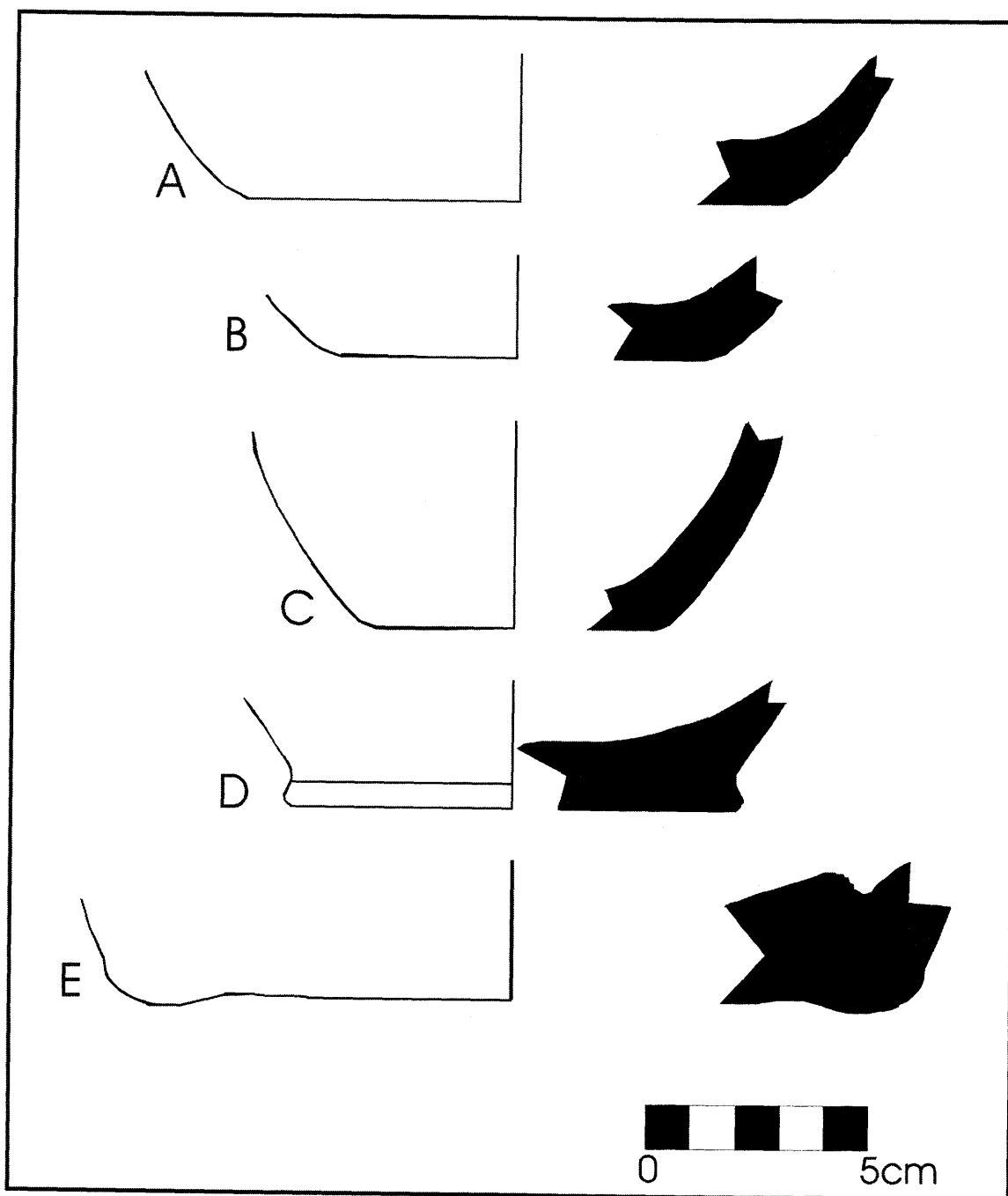


Figure A-7. Drawings of bases from WT-40. A.- C. Flat Bases WT40-A47-27-1, WT40-A47-59-1, and WT40-A53-20-1. D. Disk Base WT40-A47-29-1. and E. Ring Base WT40-A53-28-1.

APPENDIX B

PLATES: DECORATED POTTERY

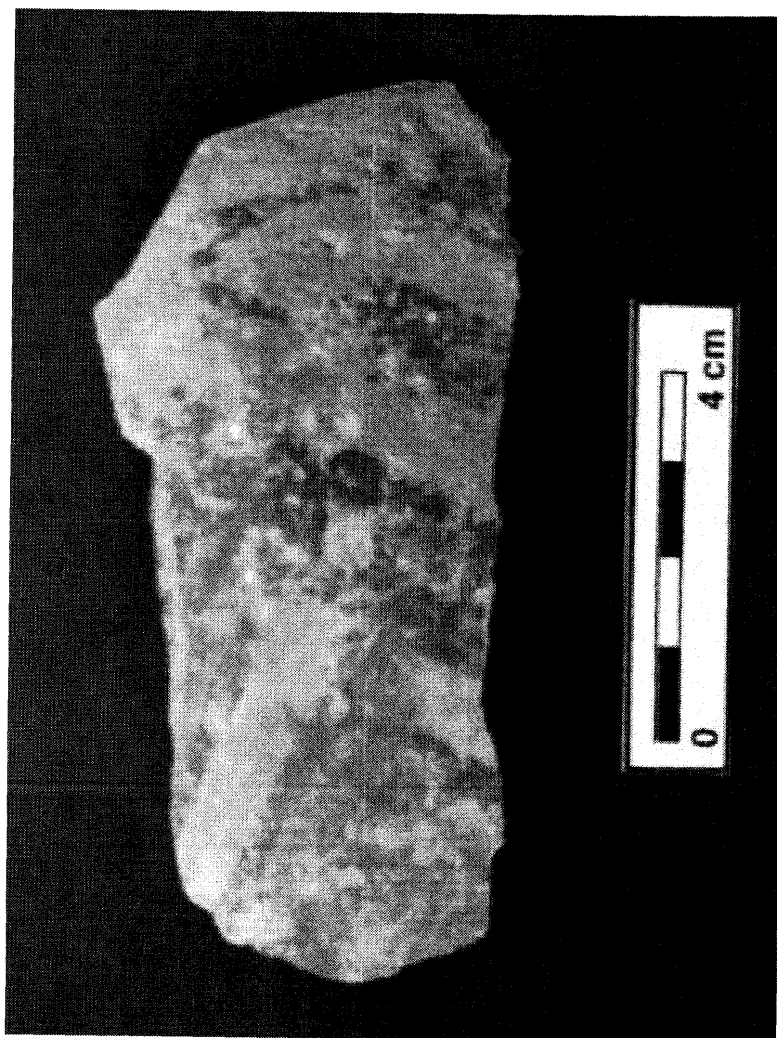


Figure B-1. Burnished wide paint decoration on WT40-A54-44-2.

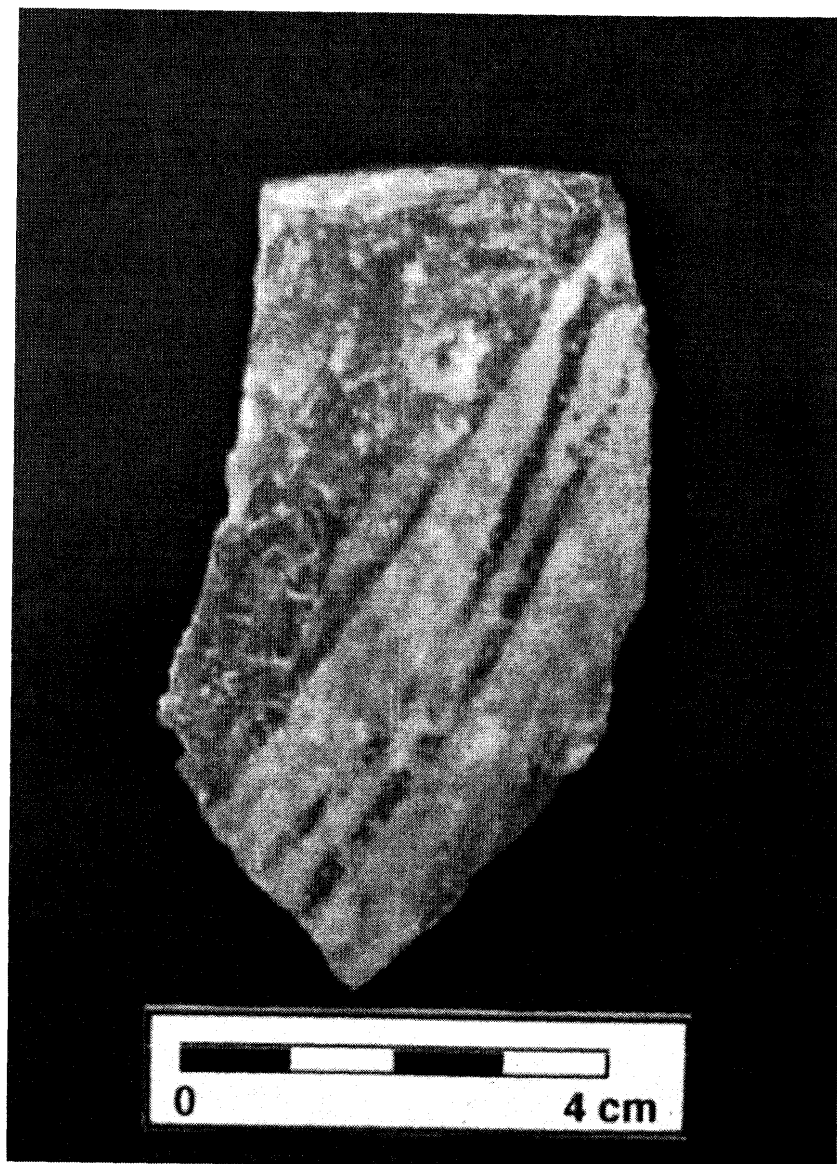


Figure B-2. Thin painted decoration on WT40-A47-27-5.

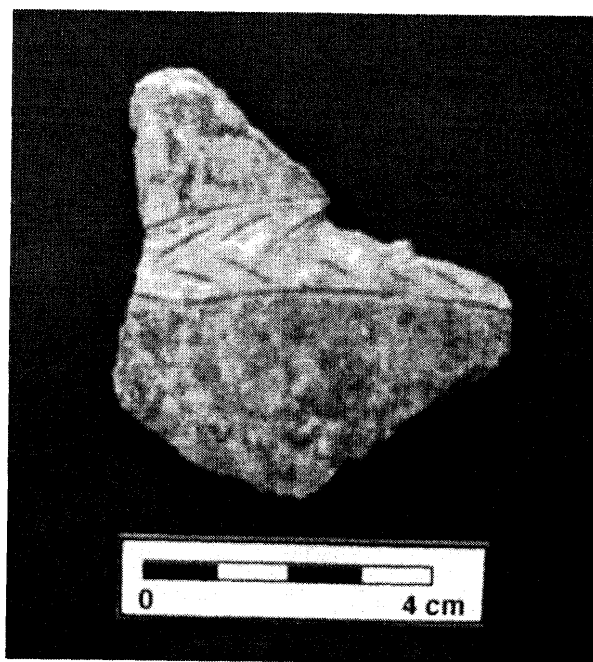


Figure B-3. Framed herring-bone incision with paint on WT40-A47-61-2.

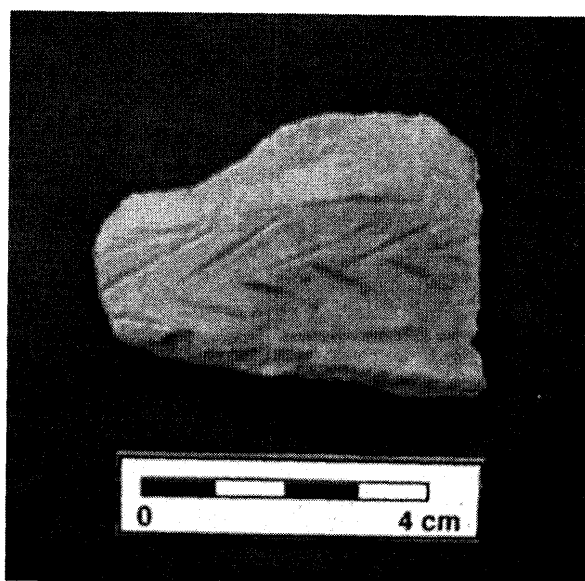


Figure B-4. Framed herring-bone incision on WT40-A47-35-1.

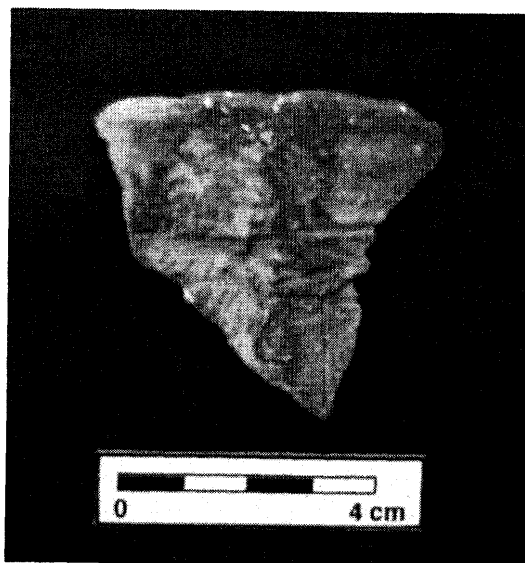


Figure B-5. Painted framed herring-bone incision on WT40-A47-52-1.

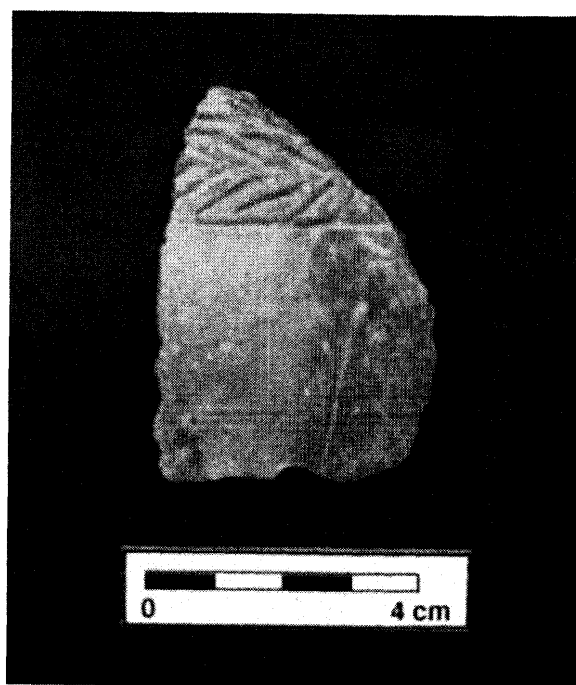


Figure B-6. Paint and framed herring-bone incision on WT40-A54-27-2.



Figure B-7. Mendable sherds WT40-A54-27-1, 5 and 6 with painted herring-bone incision.

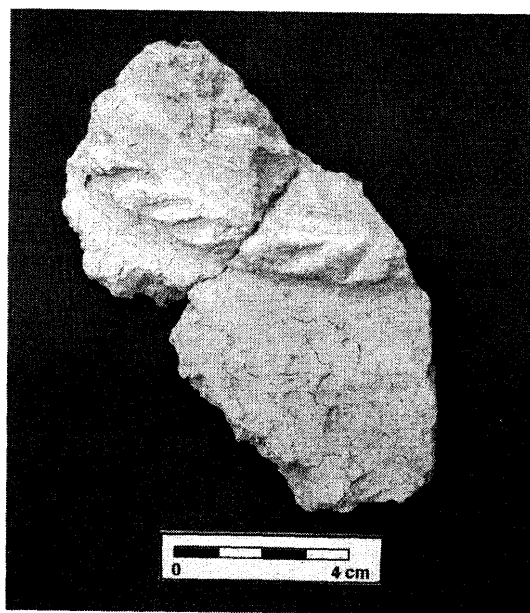


Figure B-8. Cordon appliqué on mendable sherds WT40-53-50-1 (left) and WT40-A54-62-1.

APPENDIX C

ANOVA TEST CALCULATIONS

C.1 ANOVA Test Comparing the Pottery collected from Each Unit at WT-40

Decoration	A47	A53	A54
Red Slip	13.14	4.26	2.38
Burnish	6.57	2.13	11.90
Herring-Bone incision	7.30		7.14
Plain	40.88	65.96	52.38
n	4	3	4
$\sum y$	67.89	72.35	73.80
$\sum y^2$	1940.29	4373.41	2941.92

$$\sum n = 11$$

$$\sum \sum y = 214.04$$

$$\sum \sum y^2 = 9255.62$$

$$SS_{total} = \sum \sum y^2 - \frac{(\sum \sum y)^2}{\sum n} = 5090.79$$

$$MS_{among} = \frac{SS_{among}}{a - 1} = 46.94$$

$$SS_{among} = \sum \frac{(\sum y_i)^2}{n_i} - \frac{(\sum \sum y)^2}{\sum n} = 93.88$$

$$MS_{error} = \frac{SS_{error}}{\sum n - a} = 624.61$$

$$SS_{error} = SS_{total} - SS_{among} = 4996.91$$

$$F = \frac{MS_{among}}{MS_{error}} = 0.075$$

< 4.459 therefore cannot reject H_0

C.2 ANOVA Test Comparing the Pottery Decorations at WT-40 with those at

Sha 'ar Hagolan

Decoration	WT-40 Below colluvium	Sha 'ar Hagolan (Garfinkel and Miller 2002: 98)
Red Slip	33	4161
Burnish	17	121
Wide Paint	4	578
Thin Paint	2	139
Herring-bone	11	1493
Frame Incision	6	557
Other Incision	7	111
Other Decoration	1	30
n	8	8
$\sum y$	81	7190
$\sum y^2$	1605	20234486

$$\sum n = 16$$

$$\sum \sum y = 7271$$

$$\sum \sum y^2 = 20236091$$

$$SS_{total} = \sum \sum y^2 - \frac{(\sum \sum y)^2}{\sum n} = 16931875.94$$

$$MS_{among} = \frac{SS_{among}}{a - 1} = 3158617.56$$

$$SS_{among} = \sum \frac{(\sum y_i)^2}{n_i} - \frac{(\sum \sum y)^2}{\sum n} = 3158617.56$$

$$MS_{error} = \frac{SS_{error}}{\sum n - a} = 983804.17$$

$$SS_{error} = SS_{total} - SS_{among} = 13773258.38$$

$$F = \frac{MS_{among}}{MS_{error}} = 3.21$$

< 4.600 therefore cannot reject H_0